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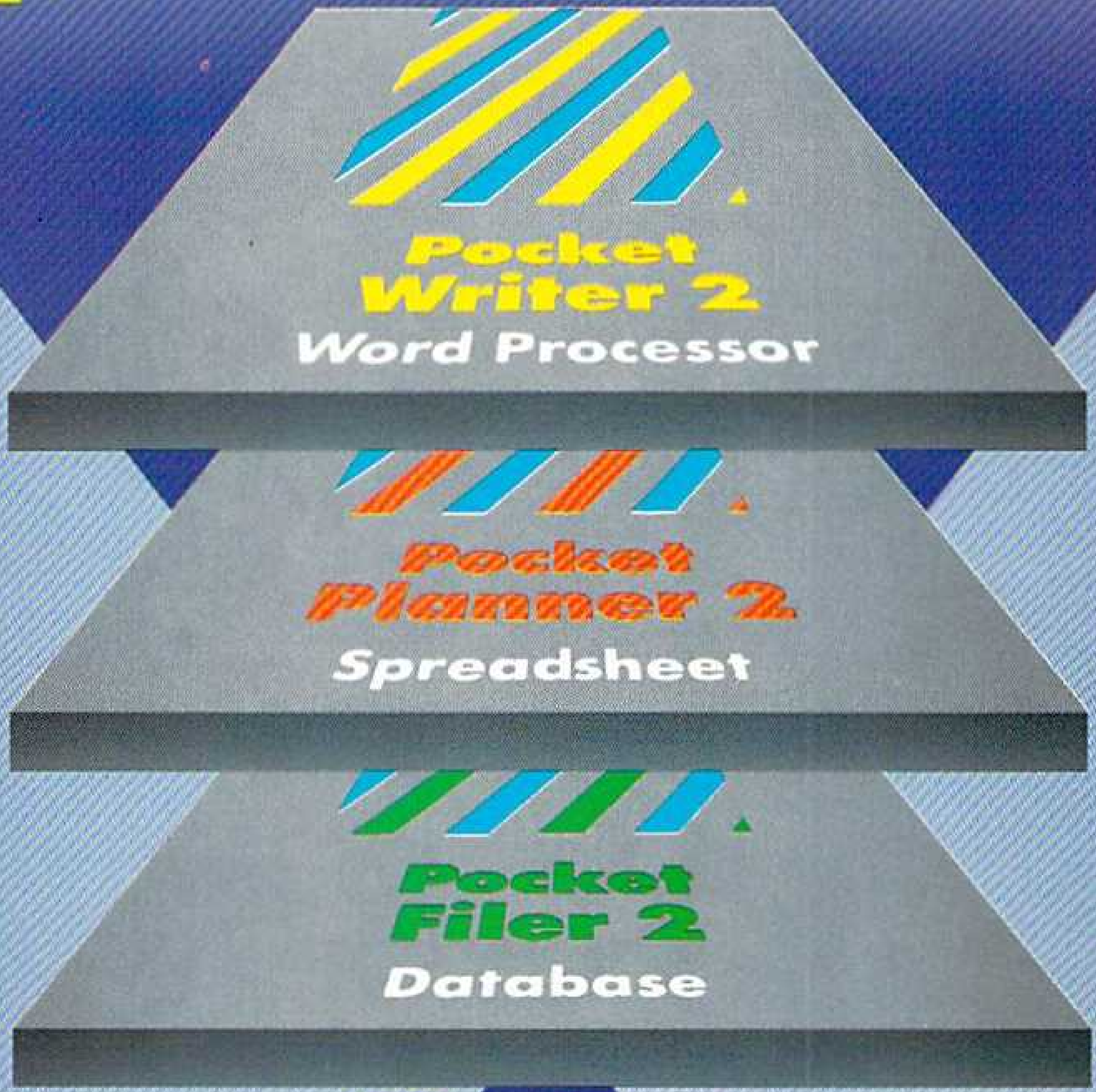
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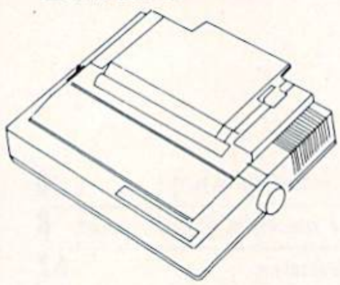
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VIEW FROM THE BRIDGE

Slowly over the course of the past year, the letters began trickling in. The trickle eventually turned to a flood and our desks became blanketed with stacks of mail two, three, and four inches high. When the *Ahoy!* editorial office starting reminding everyone of the mailbag-dumping scene in "Miracle on 34th Street," we knew the time for action had come.

We had to get bigger desks—or give our readers the Amiga coverage they were demanding.

A look at page 53 will tell you which direction we chose. Our first monthly *Amiga Section* is a Morton Kevelson tour de force, exhausting the topic of *RAM Expansion on the Amiga 1000.*

As for the C-64/128 features that make up the balance of this February issue:

• Though the term has developed criminal connotations since being coined, this month's *Rupert Report* deals with *Hacking* in its original sense: of customizing your programs and programming environment to meet your most picayune desires. (Turn to page 33.)

• You've seen window programs before, in this magazine and in others—but *Window Magic* puts them all in the shade! Richard and Sally Daley's program gives the user command of a full-featured windowing environment. (Turn to page 37.)

• Our latest graduate from *Tips Ahoy!* regular to full-fledged program contributor, Shawn K. Smith adds a quintet of BASIC commands to the C-128's Version 7.0 with *More BASIC 128.* (Turn to page 96.)

• We hope you find Bob Blackmer's games as irresistible as we do. (If you don't, we've published a dozen or so too many of them!) As usual, *Jailbreak* interweaves engaging graphics and humor in an original setting. (Turn to page 26.)

• There's no originality involved in Roy D. Lewis' *Crunchman*—but it earned its place in these pages for its remarkable mimicry of a hallowed arcade legend. (Turn to page 29.)

• Though it sounds like an article about computer club meetings, *User Conventions* is a program that catalogs all your important program instructions in a database with DOS functions, allowing easy printing of reference sheets. (Turn to page 74.)

• *The Adventurer* sends you into a gargoyle-infested cavern, armed with a stiletto and charged with the task of returning alive. (Turn to page 89.)

• If it's possible to turn a C-64 into a C-128 totally through software, *Ahoy!'s* programmers will do it. The latest utility to that effect is Robert Bixby's *Sixforty,* which doubles the resolution on the 64's screen to 640 X 200 pixels. (Turn to page 86.)

• This month's *Entertainment Software Section* focuses on the return to favor of tie-in games, with a look at four products of the *Son of License Boom: Transformers, Labyrinth, The Rocky Horror Picture Show,* and *Marble Madness.* Also reviewed are *Shanghai, Lord of the Flies, Commando, World Games, Final Four College Basketball*, and *Basketball: The Pro Game.* (Turn to page 41.)

• They say turtles can live for up to 200 years. But think back—did you ever have a pet turtle last more than two months? Today's turtle-loving youngsters, however, get a chance to extend the lifespan of a whole village full in *Turtle Rescue.* (Turn to page 15.)

• Our *Reviews* section profiles *PaperClip II* for the C-128, the *Vision 11.0* bulletin board software, and the *SuperCat* disk cataloging system. (Turn to page 67.)

This month's *Tips Ahoy!* includes a number of routines fitting firmly into the gray area between longer than usual tips and shorter than usual utilities. Perhaps we'll need to start a third category? (Turn to page 78.)

While we welcome comments on any aspect of the magazine, we're particularly interested in your thoughts on future Amiga Sections. Please write with your suggestions. These clean desks are getting us nervous!

—David Allikas

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COMMODORE PROFITABLE

In a comeback that ranks with that of Chrysler Corporation and the Monkees, Commodore International has returned to solid profitability with their second consecutive in-the-black quarter. Net sales for the fiscal quarter ended September 30 were $176 million, an increase of 11% over the prior year's period. More significantly, net income was $3.7 million versus a loss of $39.2 million the year before.

Best of all is that the company has righted itself even before entering the Christmas '86 season. The expected level of C-64, C-64C, and C-128 sales from October through December will assure Commodore's third successful quarter in a row—this one with a sizeable profit. User groups around the country can go ahead and order more stationery—Commodore is not going anywhere soon.

Commodore International, 215-431-9100 (see address list, page 14).

CBM/IBM INTERFACE

The CBM/IBM Printer Interface cable and driver ($34.95) permit Commodore-type printers to be used with IBM PC and compatible computers. The interface connects to the PC's parallel printer port and links it via a 5' cable to a Commodore-style printer. The resident driver supports virtually all text applications, as well as providing some support of IBM graphics characters and printouts.

Omnitronix, Inc., 206-236-2983 (see address list, page 14).

C-128 DATABASE MANAGER

Utilizing the capabilities of the C-128 and 1571, *Flex File 128* ($49.95) allows up to 7000 records to be sorted numerically or alphabetically, searched on up to 10 keys, selected based on up to 20 criteria, printed in label or report format, and merged with data from many popular word processors. Included are an in-memory HELP file and a 95-page manual.



The **Flex File 128** *database manager fully utilizes the 1571 disk drive and provides an 80-column display. The program's report writer supports 10 mathematical functions. A 95-page instruction manual is included.* *READER SERVICE NO. 209*

Cardinal Software, 703-491-6494 (see address list, page 14).

GREETING CARD MAKER

Activision's *Greeting Card Maker* ($34.95) lets C-64 users generate personalized cards, invitations, and announcements. Included are six different size cards included 3-D pop-ups, numerous pictures, designs, clip-art objects, and panoramic scenes, two dozen background patterns and borders, eight type styles, and a variety of verses for all occasions. An Envelope Maker designs envelopes of matching size, the Address Book maintains multiple lists up to 128 names each, and the Card Rack permits the storage of previously designed cards by occasion. Included are 20 sheets of ivory parchment stationery and instructions for ordering more materials.

Activision, Inc., 415-960-0410 (see address list, page 14).

DISK CATALOGER

Super Disk Librarian ($29.95) for the C-128 reads and catalogs disk directories and prints disk labels, handling up to 1000 disks and 14,400 program names. The program reads disks formatted in 1541, 1571, and CP/M Plus modes, as well as heavily protected disks. A number of disk utilities are also included.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 14).

SPARTAN WITH DRIVE

Mimic Systems has repackaged the Spartan Apple II+ Emulator for the C-64 to include an Apple-compatible disk drive. The decision to discontinue the DOS card in favor of the drive was prompted by requests from numerous consumers, and the amount of technical assistance re-

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quired for the installation of the DOS card in the 1541. The new price is $329.95.

Mimic Systems, 800-663-8527 (see address list, page 14).

MINISTERS' USERS GROUP

Open to people of all faiths who minister to others in a church/synagogue context, the Ministers' Users Group (M.U.G.'s Int'l) has been formed for the purpose of exchanging public domain utilities and information about commercial software of use to its members in their work. The group will forward its Religious Education Disk to anyone who forwards a disk, mailer, and $2.00 for postage (or $4.00 without disk and mailer).

M.U.G.'s Int'l (see address list, page 14).

C-64 COMMAND CENTER

Like the cabinet designed for the C-128, the Command Center for the C-64 ($119.95) and C-64C ($129.95) consolidates all peripherals into a compact enclosure, hiding cables out of sight and conserving desk space. Other features include a main power control switch, built-in AC power strip with surge protection and line noise filtering, and cooling fan. A cartridge port extension and modular telephone plug with online/offline switch are available as options.

Ketek, 319-338-7123 (see address list, page 14).

HARD DRIVES

Two Commodore hard disks:

Up to 65 times faster than the Commodore 1541 and 120 times faster than the 1571 when running on the C-128 in 128 mode, the 20 megabyte Lt. Kernal ($899.95) will load a full screen of hi-res graphics (about 11K) in less than one second. The drive, which interfaces via the expansion/cartridge port and transparently implements all 1541 DOS functions, includes an onboard DOS that adds run-time functions and several CP/M-like commands. Streaming tape backup will be made available as an option. Designed by Fiscal Information Inc. and distributed by Xetec, the drive was expected to begin production in December 1986.

Xetec, Inc., 913-827-0685 (see address list, page 14).

The expandable Data Chief hard disk system features GEOS compatibility, reprogrammable buffered operating system, storage in original individual disk format, and support of single sided C-128 and CP/M and all 2.0 to 7.0 DOS commands. The drive is available in 5 ($695), 10 ($895), and 20 ($995) megabyte versions.

ICT Inc., 301-371-4000 (see address list, page 14).

GRAPHICS DISKS

Compatible with *The Print Shop* and *Printmaster,* Epyx's new *Graphics Scrapbook* line will feature over 100 images per disk. *Chapter I: Sports* includes art for football, bowling, aerobics, and other activities, plus flyers announcing the big game, posters for the swim team tryouts, and invitations to the victory celebration. *Chapter II: Off the Wall* includes over 100 contemporary graphics including punk teddy bears, high-tech, bizarre animals, and international symbols, plus non-traditional images for holiday greeting cards. Each C-64 disk is priced at $19.95.

Epyx, Inc., 415-366-0606 (see address list, page 14).

DATE/TIME STAMP

The *Time-DOS* date and time stamping system for the C-64 and 128 with one or two 1541 or 1571 drives provides 10 direct mode commands allowing program files to be date and time stamped automatically when created, accessed, or both. All file types can be stamped manually in direct mode or under program control. The new directory displays the usual information plus the date/time stamp. A real-time calendar clock with auto-leap year function, accurate up to the year 2000, is included. The C-128 version functions in 40 as well as in

80 columns.

Family Software, 215-497-5561 (see address list, page 14).

FONTMASTER FOR 128

Xetec's 128 upgrade of its C-64 *Fontmaster* ($59.95) will feature 64K memory, 40+ fonts including Greek, Russian, Arabic, and Hebrew (with the ability to use any 9 concurrently), monitor phosphor protection, support of over 100 printers, PRG file merge, and four keyboard macros. Also included are new formatters for inserting graphics into documents and a font preview for onscreen display of printer output. The included Foreign Language Disk features Spanish, French, Korean, Danish, and more.

Xetec, Inc., 913-827-0685 (see address list, page 14).

SOUNDS AND SAMPLES

The first installments in two new product lines from MIDImouse, for use with a C-64, MIDI interface, and MIDI-compatible instrument:

The ten *Digital Horizon* sample libraries include Piano, Bass, Master Strings, Brass, Orchestra Classics, Anthology, Composer's Tool Kit, Drum Kit, Percussion, and Cosmos. The disks, $25 each or all 10 for $199.95, are available for Emulator II, Prophet 2000 and 2002, Mirage, and Akai S900, with Korg DSS-1, Emulator E-MAX, and Roland S-50 coming soon.

The *Sonic Horizon* sound collections can be had for the DX-100, 21, or 27 (2 volumes, 48 sounds per volume on cassette or disk, $24.95), DX-7, TX-7, or TX-816 (2 volumes, 128 sounds per set, on cartridge for $99.95 or disk for $59.95), Casio CZ-101, 1000, 2000, 5000, and CZ-1 (4 volumes, 40 sounds each on disk, $19.95 each), and Korg Poly-800 and EX-800 (64 sounds on cassette, $24.95).

MIDImouse Music, 503-622-5451 (see address list, page 14).

DISK DRIVE TUTORIAL

Disk Saavy ($19.95) is a step by step tutorial on using a disk drive, ex-

plaining all standard disk commands using both BASIC and C-64 Wedge syntax. Also included is information on how to repair damaged disks and how to care for your disk drive.

Chipmunk Software, 800-331-3428 (see address list, page 14).

MS-DOS TO AMIGA

DOS-2-DOS ($55.00), a disk-to-disk file transfer program, transfers all MS-DOS file types to and from AmigaDOS. The program supports full directory path names with wild cards in file names, allows selection of MS-DOS and AmigaDOS subdirectories, and displays sorted directory listings. Provided are duplicate file name detection with query/replace options, TYPE and DELETE commands, and the capability to rename files where file name restrictions occur.

Central Coast Software (see address list, page 14).

DRIVE ALIGNMENT

1541/1571 Drive Alignment ($34.95) uses video and audio prompts to report the alignment condition of the disk drive as the user performs adjustments. The program will work with the 1541 or the 1571 in C-64 or C-128 mode, autobooting to the proper mode. A second disk drive can also be addressed.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 14).

EDUCATIONAL RELEASES

Containing 13 programs, *The Works!* is intended to introduce students to four categories of computer applications. The Tools section includes Letter Writer, Loans & Investments, Calculator Math Formulas, and Weights & Measures; the Organizer category has Family Finances, Address Book, Calendar Pad, and Stock Portfolio; Arts contains Graphics Painter and Music Composer; and Learning features Typing Teacher and Math Races. Price of the C-64 disk plus 64-page teacher's guide providing lesson plans, blackline master student worksheet, and suggested classroom activities is $69.95; a Lab Pack containing six program disks and guide is $129.95.

Grolier Electronic Publishing, 408-253-4222 (see address list, page 14).

Sunburst's *Memory Building Blocks* helps students of all ages develop memory skills through five *Concentration*-type games—Pictures, Words, Shapes, Tunes, and Colors—that require them to remember what they saw and where they saw it as they hunt for matching pairs hidden under letter blocks on the game board. Teachers can edit the Words game file to suit particular classroom or individual needs and elect to place anywhere from eight to twenty letter blocks on the board. C-64 disk, backup, and teacher's guide is $59.00.

Available free from Sunburst is *Ideas: Applications of Computer Courseware,* a software catalog containing suggestions on integrating Sunburst's programs into educational curricula.

Sunburst Communications, 914-769-5030 (see address list, page 14).

Gamco's *Test Generator* lets teachers enter up to 500 questions and then design tests containing any combination, chosen by the teacher or at random. The program accepts five types of questions: fill in the blank, matching, multiple choice, true/false, and short answer/essay. Questions can be organized into and later chosen from any categories the educator wishes, such as chapter, skill, or subject. C-64 disk is $49.95; with backup, $64.95.

Also from Gamco, *Main Idea Gold Rush* simulates a journey west during the gold rush. Players move forward by correctly identifying the main idea of a paragraph they are given to read. Included is a student management system for up to 200 names. Price of the C-64 disk is $39.95; $54.95 with backup; $164.95 for class pack.

Gamco Industries, Inc., 800-351-1404; in TX call collect 915-267-6327 (see address list, this page).

TAX PROGRAM REVISIONS

Updated for the tax year 1986, the menu-driven *Taxaid* leads the user step by step through the data entry. Changes and revisions can be made and data files saved and reloaded at any time. Calculations are automatic and all tax tables, including income averaging, are built in. $39.95 on disk for the C-128 or Plus/4, or on disk or tape for the C-64 or VIC 20 (+16K).

Taxaid Software, Inc., 218-834-5012 (see address list, this page).

Also menu-driven and reflecting all the new tax laws, *Tax Command* incorporates Forms 1040, Schedules A through G, R, and SE, Forms 1040-ES, 2106, 2119, 2441, and 3903.

Practical Programs, Inc., 414-272-7227 (see address list, this page).

ML UTILITY UPGRADES

Revisions to a pair of assembly language programs from Schnedler Systems:

The *Symbol Master Version 2.0* symbolic disassembler ($49.95), with versions for the C-64 and C- 128, permits the use of labels (coded as to usage) on each line referenced by another instruction, together with a listing of equates at the beginning and a cross-reference label at the end, allowing one to see the overall structure and flow of a program. The disassembler outputs a formatted disassembly to screen or printer, and source code files to disk compatible with *MAE, PAL, CBM, Develop-64, LADS, Merlin,* and *Panther.* The new version includes a label name editor for altering label names used in the disassembly and support of .WORD pair tables. The 6502 undocumented op-codes can be disassembled, as well as the enhanced 65C02 instruction set. The C-128 version resides in either RAM 0 or RAM 1, and can disassemble from any of the 16 bank configurations.

The *PTD-6510 Version 4.0* ($49.95), with improved memory usage and loading procedures compared to earlier versions, lets C-64 assembly language programmers test and debug code. Watch windows allow the user to observe program variables while stepping through, not just the 6502 registers. The PTD's own compiled language makes it possible to write efficient driver programs for automatically stepping through code at a rate of 1000 instructions per second. Fully symbolic, the debugger lets you refer to everything by a name rather than a number.

Schnedler Systems, 703-237-4796 (see address list, this page).

TELECOM NEWS

CompuServe has reduced their charge for 2400 baud access, making it the same as their 1200 baud rate. The new price per connect hour is $15 (formerly $22.50) daytime and $12.50 (formerly $19) evenings and weekends.

CompuServe, 614-457-8600 (see address list, this page).

Continued on page 83

Companies Mentioned in *Scuttlebutt*

Activision, Inc.
2350 Bayshore Parkway
Mountain View, CA 94043
Phone: 415-960-0410

Cardinal Software
14840 Build America Dr.
Woodbridge, VA 22191
Phone: 703-491-6494

Central Coast Software
268 Bowie Drive
Los Osos, CA 93402
Phone: 805-528-4906

Chipmunk Software
Box 463
Battleground, WA 98604
Phone: 800-331-3428

Commodore Int'l
1200 Wilson Drive
West Chester, PA 19380
Phone: 215-431-9100

CompuServe
5000 Arlington Centre Bd.
Columbus, OH 43220
Phone: 614-457-8600

Covidea
300 Jericho Quadrangle
Jericho, NY 11753
Phone: 516-937-7000

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Epyx, Inc.
600 Galveston Drive
P.O. Box 8020
Redwood City, CA 94063
Phone: 415-366-0606

Family Software
3164 Surrey Lane
Aston, PA 19014
Phone: 215-497-5561

Firebird
P.O. Box 49
Ramsey, NJ 07446
Phone: 201-444-5700

Free Spirit Software, Inc.
538 S. Edgewood
LaGrange, IL 60525
Phone: 312-352-7323

Gamco Industries, Inc.
Box 1911
Big Spring, TX 79720
Phone: 800-351-1404; in TX 915-267-6327

Grolier Educational Publishing, Inc.
95 Madison Avenue
New York, NY 10016
Phone: 212-696-9750

ICT Inc.
103 Baughman's Lane
Suite 301
Frederick, MD 21701
Phone: 301-371-4000

Ketek
P.O. Box 203
Oakdale, IA 52319
Phone: 319-338-7123

Mimic Systems
c/o EDP Industries
#205-1401 West 8th Ave.
Vancouver, B.C.
V6H 1C9 Canada

M.U.G.'s Int'l
9 Lamport Street
Vittoria, Ontario
N0E 1W0 Canada

MIDImouse Music
Box 272-MS
Rhododendron, OR 97049
Phone: 503-622-5451

Northland Accounting
606 Second Avenue
Two Harbors, MN 55616
Phone: 218-834-3600

Omnitronix, Inc.
P.O. Box 43
6014 East Mercer Way
Mercer Island, WA 98040
Phone: 206-236-2983

Osborne/McGraw-Hill
2600 Tenth Street
Berkeley, CA 94710
Phone: 415-548-2805

Practical Programs, Inc.
Box 93104
Milwaukee, WI 53202
Phone: 414-272-7227

QuantumLink
8620 Westwood Center Dr.
Vienna, VA 22180
Phone: 800-392-8200 or 703-448-8700

Schnedler Systems
1501 N. Ivanhoe
Arlington, VA 22205
Phone: 703-237-4796

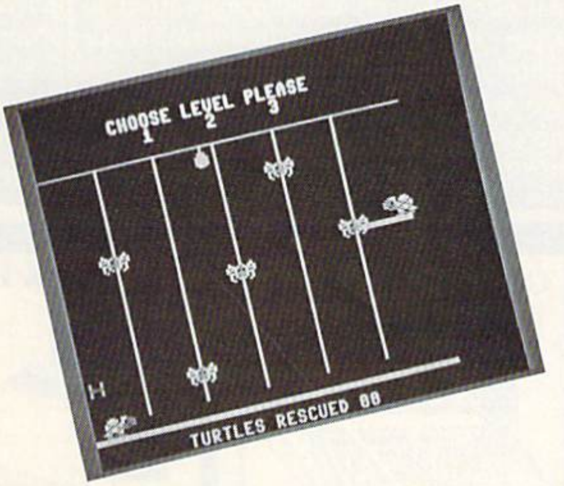
Scott, Foresman and Co.
1900 East Lake Avenue
Glenview, IL 60025
Phone: 312-729-3000

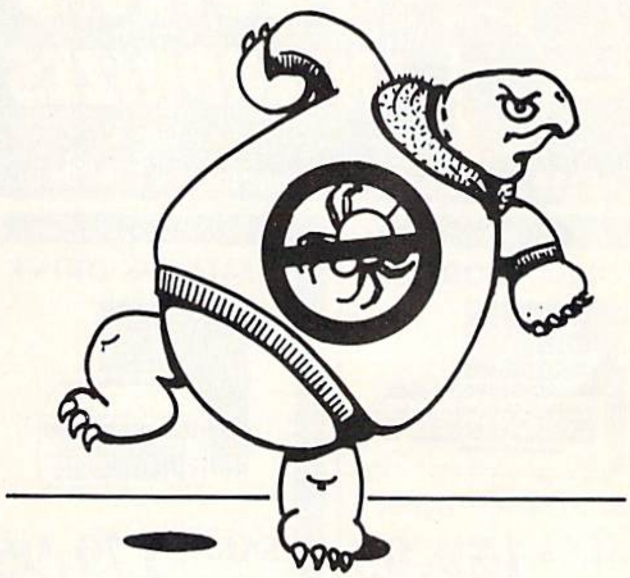
Strategic Simulations
1046 N. Rengstorff Avenue
Mountain View, CA 94043
Phone: 415-964-1353

Sunburst Communications
Pleasantville, NY 10570
Phone: 914-769-5030

Xetec, Inc.
2804 Arnold Road
Salina, KS 67401
Phone: 913-827-0685

TURTLE RESCUE





For the C-64

By Behzad Jamshidi

Turtle Village is a place deep in the woods where all the little turtles, including you, once lived in perfect harmony. You, Speedy Turtle, were the fastest of them all.

One day the land on which the village was built was overtaken by five giant spiders. Your turtle friends were all captured and taken away from the village. Now it's up to you to rescue as many of your friends as you can.

Turtle Rescue is a children's game written in machine language. Type in the listing on page 110 using *Ahoy!'s Flankspeed* program (see page 101) and save to disk. To load the game, type LOAD "TURTLE RESCUE",8,1 followed by SYS 49152. Make sure the joystick is plugged into Port 2.

HOW TO PLAY

Once you have typed SYS 49152 and pressed RETURN the game screen appears. At the top of the screen three levels of difficulty are shown; you select the speed (1-3, where 1 is the slowest and 3 is the fastest). On the bottom of the screen the number of rescued turtles is shown. Speedy Turtle is positioned on the bottom left hand side of the screen while his friends appear one at a time high above the ground on a platform. Your task is to travel back and forth across the screen carrying ladder pieces and setting them up underneath the platform. In order to rescue a turtle you need 10 ladder pieces. To carry a ladder piece, simply guide Speedy Turtle to the left side of the screen where a picture of a ladder is shown. To position a ladder underneath the platform, guide Speedy Turtle to the right side of the screen. While Speedy Turtle is busy trying to rescue his friends he needs to worry about two things: the five giant spiders and the drop of freezing rain that drips from the sky. When carrying ladder pieces, avoid any contact with the spiders since they can steal what you have. The only hazard to Speedy Turtle's health is the freezing rain, which can freeze him and end his mission.

Press the RUN STOP key any time during the game to restart the program. ☐

SEE PROGRAM LISTING ON PAGE 110

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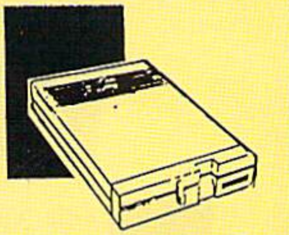
COMMODORE 128



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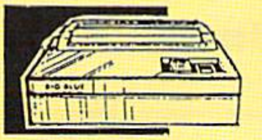
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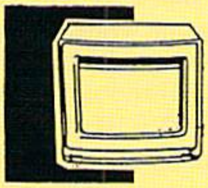
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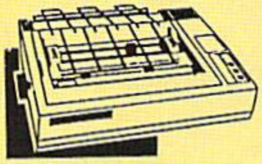
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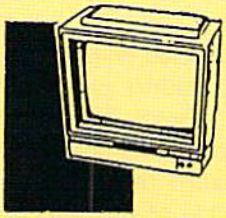
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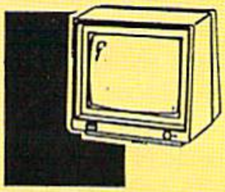


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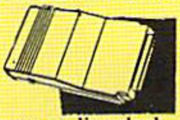
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Allows use of C-128 and C64 mode - composite and 80 column RGB mode. Must be used to get 80 columns in color with 80 column computers. Specially designed for use with the C128's special composite video output, plus green screen only option switch. (add $14.50 shipping)

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12" 80 Column Green/Amber Monitor

Super high resolution composite green or amber screen monitor. 80 columns x 24 lines, easy to read. Fantastic value. Limited Quantities.

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Turn Your Monitor into a TV Set Without Moving Your Computer

Elegant TV Tuner with dual UHF/VHF selector switches goes between your computer and monitor. Includes mute, automatic fine tuning and computer-TV selector switches. Inputs included for 300 ohm, 75 ohm, and UHF. Can be used with cable TV and VCR's. Fantastic Value. Limited Quantities. (Includes loop antenna for UHF & RCA connecting cables) (Add $3.00 Shipping. Plus $3.00 for APO/FPO).

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15 Day Free Trial - 90 Day Immediate Replacement Warranty

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No Monitors shipped A.P.O.-F.P.O. or Alaska

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BIG BLUE

Super Print Quality

80 Column Printer • 8½'' Letter Size

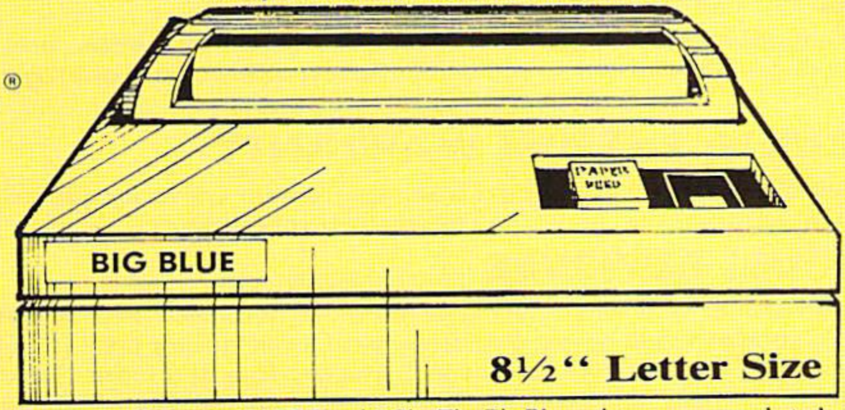
We Like this Printer so much
We Bought Out the Factory

SALE $39.95 SALE

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Now you can have a full fledged 8½'' letter size 80 column printer for less than the cost of a large box of paper. This printer uses advanced dot matrix, heat transfer technology to print upper and lower case (with true lower descenders), underline, enlarged, all points addressable graphics plus More. Print out pictures, program listings, wordprocessing pages, graphics and more. Perfect for the homeowner or student and definitely affordable. List $199.00 **Sale $39.95**

Commodore® **IBM®** **Atari®** **Apple®**



This printer was made by **Canon®** for the IBM PC and PCjr. The Big Blue printer comes ready to hook up to the serial port of the **IBM®**PC jr. Plus with low cost adapter cables you can connect the Big Blue printer to the **Apple®** II,IIe,IIc, **Apple Compatibles, Atari®, Commodore®** 64 ,128, SX-64, Vic 20, Plus 4, **IBM®**PC, **IBM®**XT, **IBM®**AT, **IBM Compatibles** , TI-99, Tandy 1000, plus many more.

Intelligent Commodore® Interface—Connects Big Blue to the printer port of the C-64 and 128. Print graphics, us Printshop, word processors and more .... List $49.95 **Sale $19.95**

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Paper (2 Rolls).......... List $19.95 **Sale $ 5.95**

Complete Printer Care Kit .... List $29.95 **Sale $19.95**

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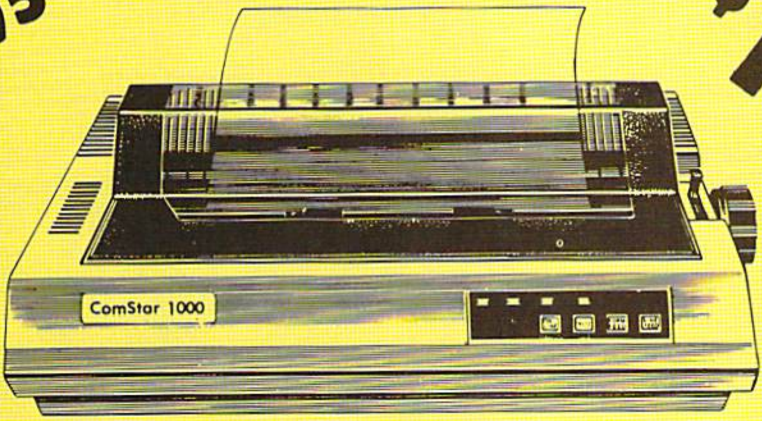
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Best Value in the USA

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Easy to Use

Fantastic Graphics

2 Year Ltd. Warranty

The Comstar 1000 is one of the best values in the United States today. Print your letters, documents, programs, pictures, and more at a blazing 100 Characters Per Second or 20 cps in the Near Letter quality mode. (Looks just like it came from a typewriter.) Plus, choose your printing mode (NLQ, Draft) from your wordprocessor or by simply pushing the controls on the front panel. Fantastic Quality at a Fantastic Price. List $349.00 **SALE$179.95.**

Print Method
Serial impact dot matrix (9 pin)

Print Speed
Draft- 100 CPS NLQ- 20 CPS

Character Sets
96 ASCII Characters, Symbols (includes italic font)

Ribbon (Life exp.)
Black: cassette (2.5 million characters)

Dimensions
15.4 (W) x 10.9 (D) x 4.7 (H) inch

Weight
Approx. 10 lbs

Character Spacing
Fixed

Line Spacing
1/6, 1/8, 7/72, and 1/216 inch

Paper Feed
Adjustable tractor and friction feed

Printing Direction
Bi-directional

Copies
2 plus original

Interfaces

IBM $59.00 • Apple $59.00 • Atari $49.95 • Commodore $49.95 • Laser 128 $19.95

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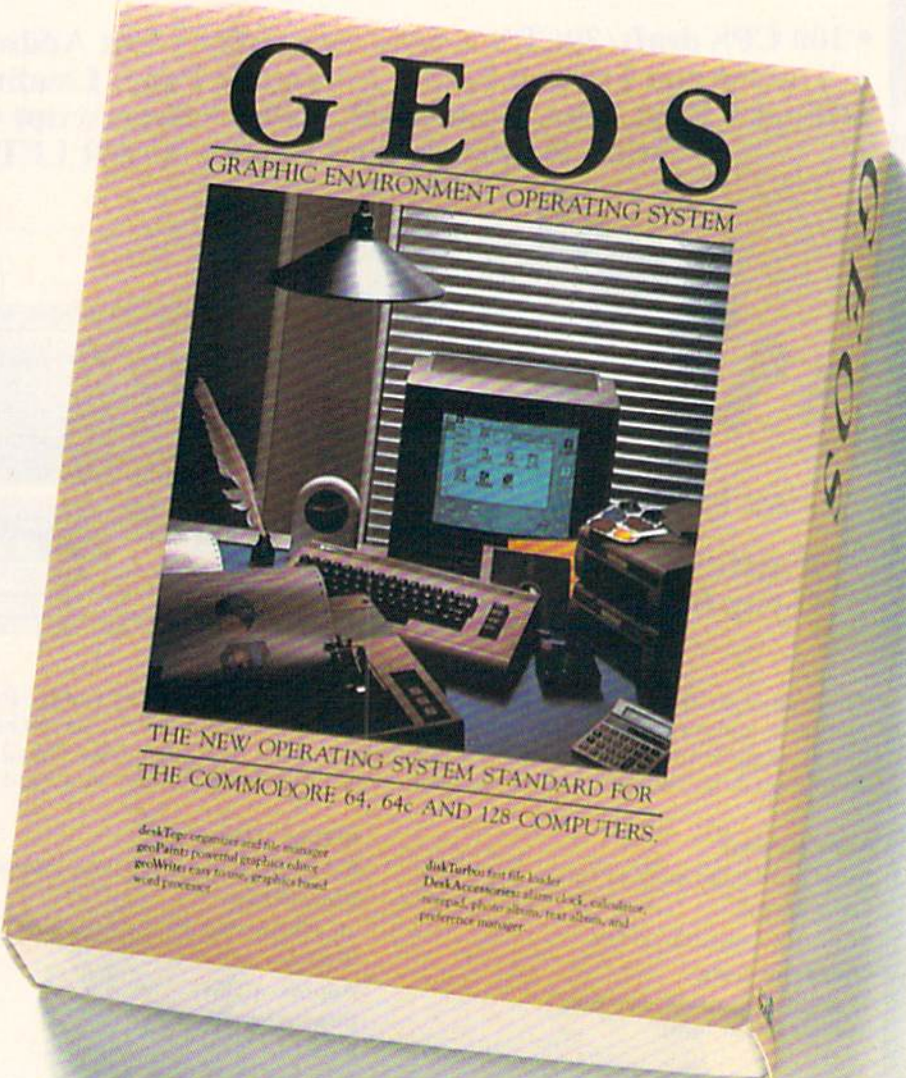
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Reader Service No. 216

SCIENTISTS
DISCOVER NE



When we started our company on the west coast, people thought we were a little spaced out. So you can imagine their reactions when we announced we'd discovered a new universe.

People laughed. People scoffed. And they really freaked out when we told them where we'd found it:

Inside a Commodore 64.

It's called GEOS. And it turns any Commodore into a powerful PC that holds its own against any computer, no matter what kind of fruit it was named after.

GEOS: The superior intelligence. Of course, we always knew Commodores possessed superior brains. It just took GEOS to discover them.

You see, GEOS opens your Commodore to a huge universe that can hold an infinite number of applications. Which means that GEOS can do just about anything the expensive PC's can do, including one thing they can't:

Add even more GEOS applications that are being developed even as you read this.

Increase your speed to warp factor 7. The first thing you notice with GEOS is how its diskTurbo speeds up your Commodore's disk loading and storing time.

Not twice or three times as fast. But five to seven times faster than normal. Which lets you streak through files and documents at what seems like warp speed.

And that saves you endless time.

Every universe comes complete with a desk. The way to keep order in our universe is with the GEOS Desktop. It's just like your desk at home, only without the coffee stains.

The Desktop keeps your art and documents filed, and comes

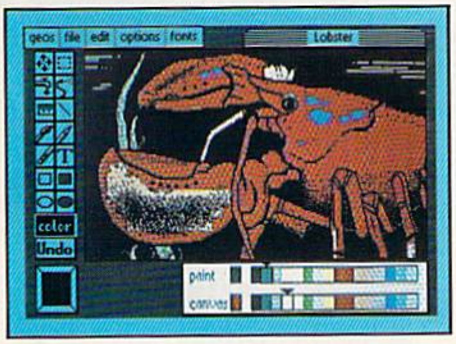
AT BERKELEY
EW UNIVERSE.

with all the accessories you need to keep you organized:

An alarm clock keeps you punctual. A notepad keeps your memos. And a calculator keeps your accountant honest.

How to communicate with a new universe. With geoWrite, you can rearrange your written words. Move blocks of copy. Cut and paste. And even display your text in fonts of different styles and sizes, right on the screen.

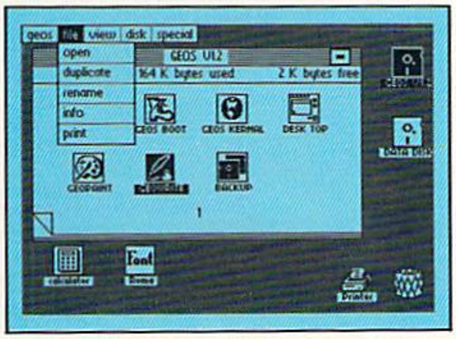
With geoPaint, you become a Michelangelo with a mouse.



Sketching and painting with all kinds of colors, textures and patterns.

You can invert, mirror and rotate images. Insert them into your geoWrite documents. And save them in your GEOS Photo Album for use later.

Finding your way through the universe. The most difficult



thing about a new universe is finding your way around. But with GEOS, you only need to remember two things:

Point and click.

When GEOS offers you options, you just point to your answers and click your mouse or joystick.

You want to draw? Point and click.

You want to write? Point and click.

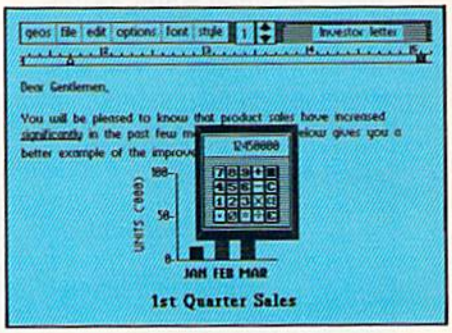
You want to fill in that obtuse rhomboid with an air-brushed geometric pattern in a lighter shade of pink? Point and click.

Easy, huh? And in case you ever do make a mistake, GEOS backs you up with an "Undo" feature that undoes the very last command you entered.

Running out of space. With GEOS, that's hardly likely. Because there's endless space in the universe for new applications.

Unfortunately, there's only so much space in this ad.

So zip down to your nearest software dealer. Tell him you want to explore the new universe in your Commodore.



And if he looks at you like you're some kind of alien, well, just tell him Berkeley Softworks sent you.

The name is universally known.

To order, call 1-800-443-0100 ext. 234

GEOS is just $59.95

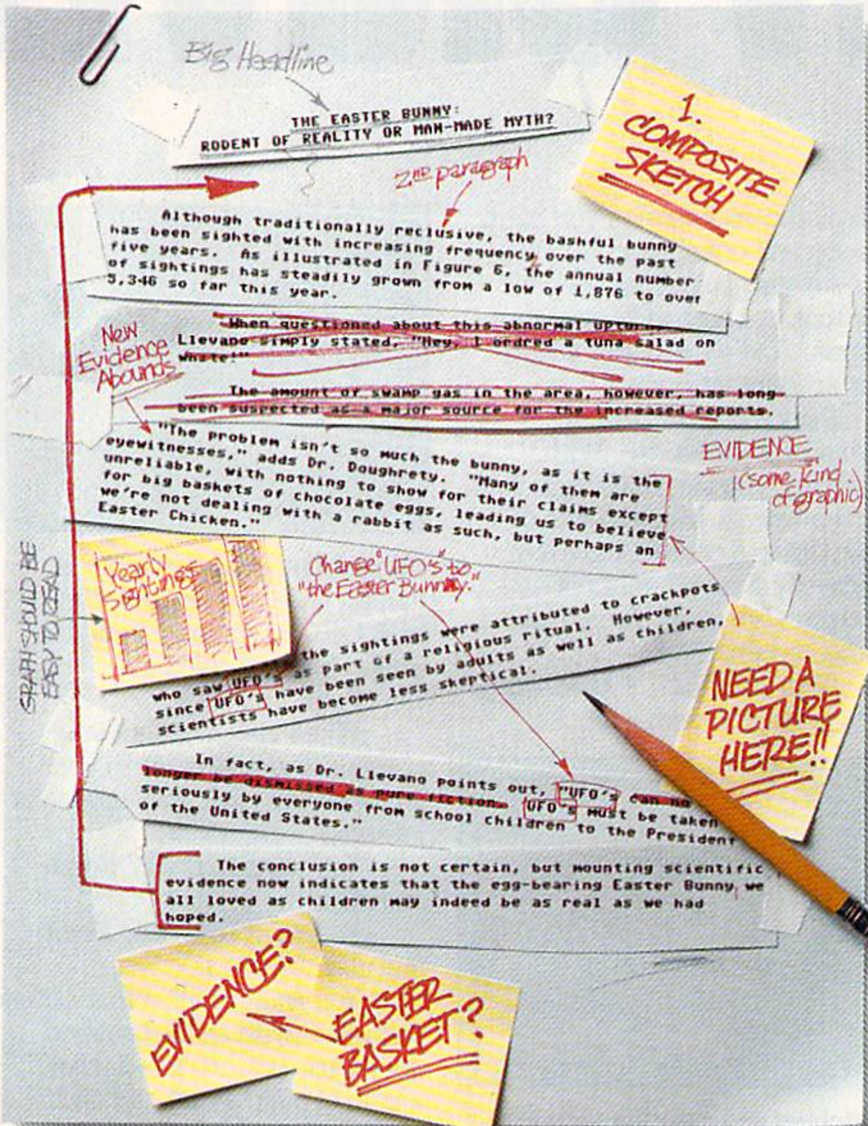
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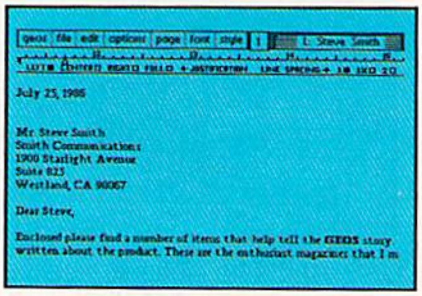
THE STRON
ARE BUILT WIT



Whether you're building an argument or just hammering out a memo, any project looks better when you put it together in Writer's Workshop. The supercharger that powers your GEOS-equipped Commodore through even the most wrenching assignments.

Sharpen your skills. The first thing to do in the Workshop is plug into geoWrite 2.0, which contains all the brand new tools you need to hone any rough concept into a well-crafted document.

You get headers. Footers. Subscripts and superscripts. You can center your text. Right justify. Full justify. And nail



down formatting problems with variable vertical spacing and adjustable margins.

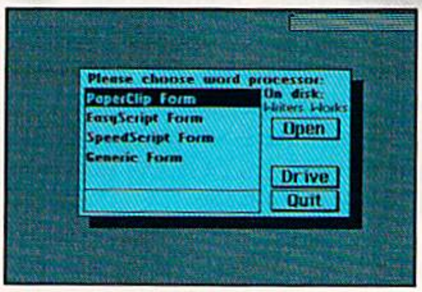
The Workshop cuts down on your manual labor, too. With one-stroke, "shortcut" keyboard commands. They keep your hands off the mouse so you can keep your mind on your work.

In fact, there's a complete set of heavy-duty accessories that not only strengthen your writing, but reinforce its structure, as well.

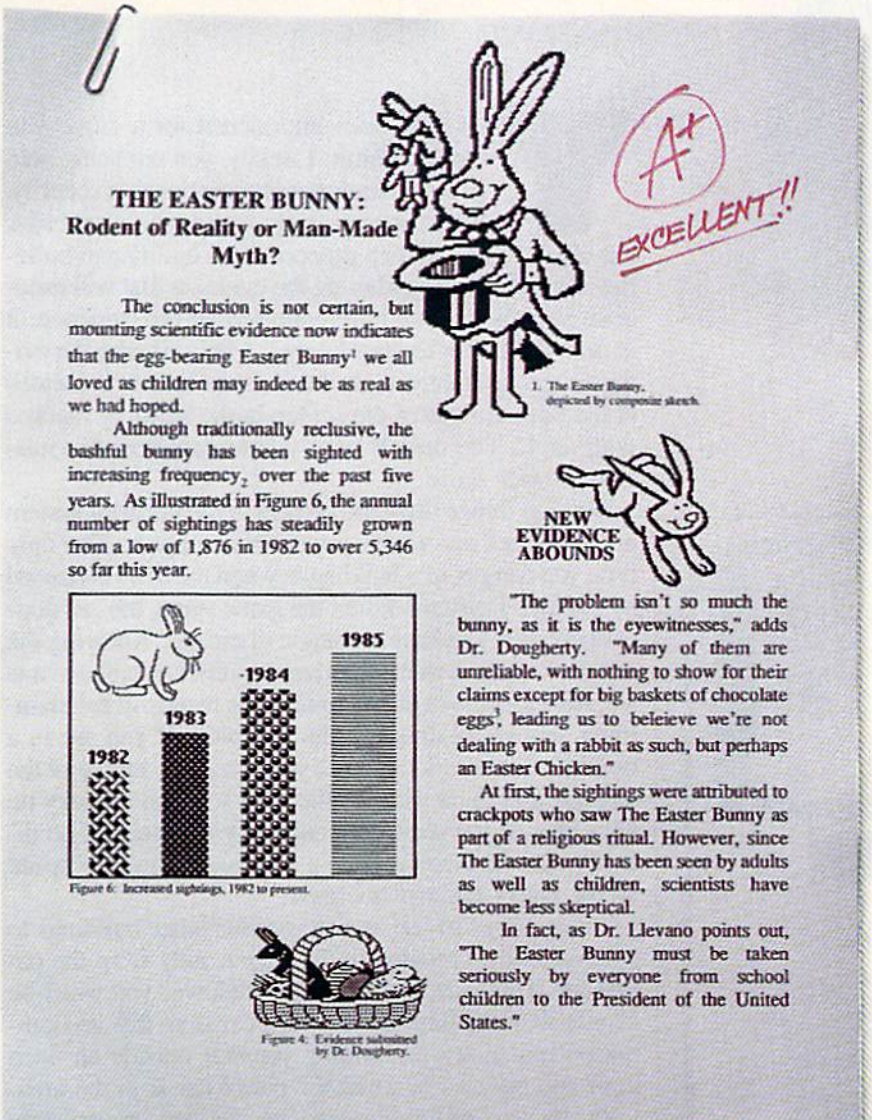
Replace old, worn-out parts. You can build anything with Writer's Workshop. And repair old stuff, too. Just decide which parts have to come out and which new ones go in.

Then hit the key and stand back.

Instantly, the "search and replace" drills through your old



GEST CASES
H A WORKSHOP.



THE EASTER BUNNY: Rodent of Reality or Man-Made Myth?

The conclusion is not certain, but mounting scientific evidence now indicates that the egg-bearing Easter Bunny[1] we all loved as children may indeed be as real as we had hoped.

Although traditionally reclusive, the bashful bunny has been sighted with increasing frequency[2] over the past five years. As illustrated in Figure 6, the annual number of sightings has steadily grown from a low of 1,876 in 1982 to over 5,346 so far this year.

Figure 6: Increased sightings, 1982 to present.

1. The Easter Bunny, depicted by composite sketch.

NEW EVIDENCE ABOUNDS

"The problem isn't so much the bunny, as it is the eyewitnesses," adds Dr. Dougherty. "Many of them are unreliable, with nothing to show for their claims except for big baskets of chocolate eggs[3], leading us to beleieve we're not dealing with a rabbit as such, but perhaps an Easter Chicken."

At first, the sightings were attributed to crackpots who saw The Easter Bunny as part of a religious ritual. However, since The Easter Bunny has been seen by adults as well as children, scientists have become less skeptical.

In fact, as Dr. Llevano points out, "The Easter Bunny must be taken seriously by everyone from school children to the President of the United States."

Figure 4: Evidence submitted by Dr. Dougherty.

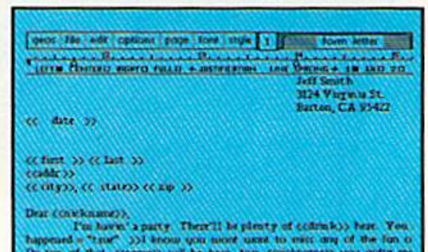
text, replacing worn-out words and phrases with your brand new ones.

For more serious cases, hand the job over to the Workshop's Text Grabber. It takes text from several word processors—like Paper Clip™—and lets you overhaul them with new GEOS fonts, formats and graphics.

A few more built-in features. Every project leaves the Workshop looking beautifully finished, too. Because it not only comes with LaserWriting compatibility, there's even a LaserWriter for you to print on.

You simply upload your files to QuantumLink.™ Then they're printed and mailed back.

Convenient, or what?



Of course, you don't want to keep good-looking documents like this to yourself. So we built in geoMerge. Which customizes your geoWrite form letters to people on your mailing lists.

So if your plans call for some real masterpieces, do something really constructive about it. Call your software dealer and requisition Writer's Workshop.

Who knows? You just might build a name for your self.

To order call 1-800-443-0100 ext. 234
Writer's Workshop $49.95
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WRITER'S WORKSHOP

GEOS COMPATIBLE



Berkeley Softworks

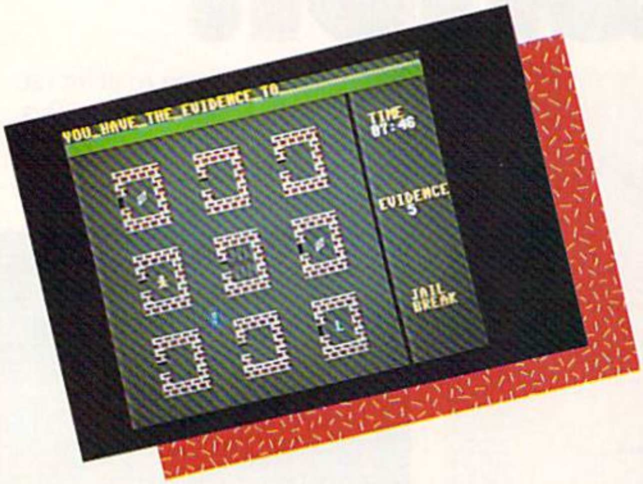
The brightest minds are working at Berkeley.

Reader Service No. 171

JAILBREAK

For the C-64

By Bob Blackmer



You have been imprisoned for a crime you didn't commit. Luckily, you are being held in an institution with questionable security. When you get your chance, you must break out of jail. You will then proceed from building to building in the complex, gathering the evidence that will exonerate you. When you have collected all the evidence, it is time for a visit to your lawyer, who will take the evidence and see that you are freed. Your lawyer is located at the bottom right of the screen in the building marked with an 'L'. The time it takes you to complete this mission is your score.

Making things difficult for you is the security system and the scout car which patrols the complex. The only time you can get in a building is when the door is opened by the faulty system. When the game starts, the jail door is open, and you have a chance to escape. Knowing the problems their system experiences, officials will activate a master lockdown at any time. This results in the slamming shut of all doors in the complex. If you are in a building during a lockdown, you are at the mercy of the system, and must wait for the door to open to carry on your task. If the patrol car catches you, you will go directly to jail, there will be a lockdown, and the speed of the patrol car will increase.

One strategy to use as you wait for other buildings to open is to keep moving in the streets away from the patrol car. This way, if there is a lockdown, you won't be caught in a building. If the patrol car is so fast you cannot outrun it, try positioning yourself outside an open door and only go in when the patrol car is in the area.

At the start of the game, since you can immediately get out of jail and easily outrun the patrol car, you should be able to complete your mission in about two minutes. If the patrol car has ever caught you, or you get locked in buildings, it can take quite some time.

Good luck! Remember, be quick, be sneaky, be patient, and use a joystick in Port #2.

Jailbreak is written entirely in machine language and must be entered using *Flankspeed* (see page 101). After typing in and saving *Jailbreak*, reset the computer and LOAD "JAILBREAK",8,1. Then SYS 49152 to start. □

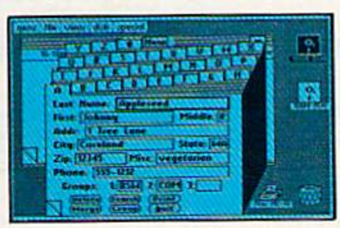
SEE PROGRAM LISTING ON PAGE 106

ARE YOU SEARCHING FOR FRIENDS?



If you're finding it increasingly difficult to find anything at all, maybe it's time you found out about geoDex. The GEOS-compatible directory that generates mailing lists. Prints address labels. And sorts out all sorts of things for your Commodore.

Try directory assistance. With a little help from geoDex, you can call up a directory organized from any three categories you choose. Which means you can list your friends by name, telephone number or almost anything else that can be assigned its own three-character code.



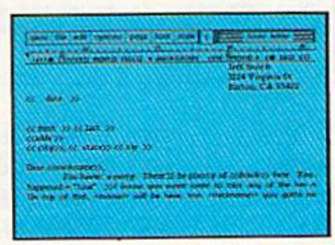
Like "MEN" for guys you know. Or "GRL" for girls you know. Or "FOX" for girls or guys you'd like to know.

But no matter how you choose to categorize them, if you can point and click a mouse, you can call up any list of friends with geoDex's easy-to-read graphics.

Our most inviting feature. Of course, once you've gotten your friends organized, the next thing we recommend you do with geoDex is really very simple.

Throw a party.

You see, geoDex comes with geoMerge, a mail merge program that customizes form letters, announcements—even party invitations—with the names and addresses stored in geoDex. First you write the letter with geoWrite. Then you select a list from geoDex.



Put them both together with geoMerge and it's toga time!

The search is over. So if you're tired of looking for friends, waltz right down to your software dealer and ask him for geoDex. We can't guarantee it'll win you more friends, but it'll certainly keep you from losing them.

To order call 1-800-443-0100 ext. 234

geoDex $39.95

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CUSTOMER DESIGNED FOR
COMMODORE 64 & 128 COMPUTERS



- BUILT-IN "WARM RESET" BUTTON WILL ELIMINATE TURNING POWER OFF/ON TO RESET
- PARALLEL EXPANSION PORT ON L'BOW'S BACKSIDE ALLOWS SIMULTANEOUS HARDWARE & SOFTWARE ACCESS.
- VERTICAL CARTRIDGE PORT MAKES CARTRIDGE USE MUCH EASIER.
- NO MORE STRESS ON THE COMPUTER'S PRINTED CIRCUIT BOARD FROM THE PRESSURE OF PLUGGING IN CARTRIDGES SINCE 'LBOW PUTS IT ALL ON THE TABLE TOP.

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'LBow™ DELUXE $29.95

AS SHOWN IN INFO-64, THE SWITCHABLE L'BOW. TWO CARTRIDGES PLUGGED IN AT THE SAME TIME, SWITCH FROM ONE TO THE OTHER PLUS A BUILT-IN 'WARM RESET' BUTTON. FOR THE C128 OR C64.

DISK DOUBLER®

CUTS A PRECISION SQUARE NOTCH IN THE DISKETTE AT EXACTLY THE RIGHT SPOT SO THE "FLIPSIDE" CAN BE USED.



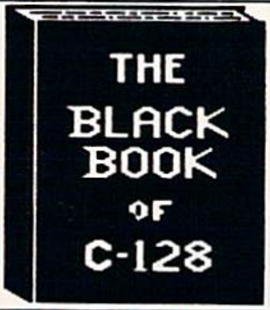
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128 CABLE

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THE BEST FRIEND A C128 OWNER EVER HAD. COVERS THE C64, 128, CPM 3.0 1541 AND 1571 DISK DRIVE.

261 PAGES, 75 EASY TO READ CHARTS AND TABLES. NO WASTED PAGES. EACH CHAPTER COLOR CODED, ALWAYS FIND WHAT YOU NEED. THINK OF THE BLACK BOOK AS A DICTIONARY,ALWAYS READY TO ANSWER YOUR QUESTIONS.

MONITOR SWITCH



THIS IS THE SWITCH YOU HAVE ASK FOR !!!! SHARE ONE MONITOR BETWEEN TWO COMPUTERS. FLIP THE KNOB ANY TIME AND CHANGE OUTPUT THE BOX HAS 2, 8 PIN CABLES, ONE TO EACH COMPUTER PLUS A 8 PIN SOCKET FOR MONITOR FOR THE C64 OR C128.

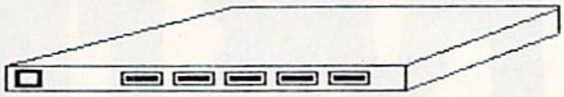
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LIGHTED ROCKER SWITCHES
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INCLUDES A SWITCH FOR COMPUTER, MONITOR, PRINTER, AUX. 1 AND 2. PLEASE INCLUDE $5.00 SHIPPING FOR THIS ITEM.

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SOLVE THE PUZZLES OF SOFTWARE PROTECTION. FOR AUTHOR OR NEW USER. BECOME A MASTER OF ILLUSION. LEARN HOW TO PROTECT OR UN-PROTECT YOUR SOFTWARE. INCLUDES BASIC PROGRAM SECURITY. LEARN HOW COMPILERS, HALF TRACKS ETC, EFFECT A DISK.REVEALS MYSTICAL SECRETS OF THE C-64.BOOK IS 141 PAGES. A FREE DISK OF 21 UTILITY PROGRAMS ARE INCLUDED. THE BOOK IS WRITTEN AT A LEVEL A BEGINNER CAN UNDERSTAND.

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BRAND X IS A DISK CATALOGER. 4,000 FILES OR 100 DISKS. ADD SAVE, ETC. IDENTIFIES 14 FILE TYPES, PRINT LISTS IN 1 2 OR 3 COLUMNS, PLUS LABELS. END DISK CONFUSION WITH BRAND X.

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VIDEO LOG 64 CATALOGS MOVIES YOU HAVE SAVED ON VIDEO TAPE. 1,000 FILMS, OR 250 TAPES. PRINT LIST OF TITLES, OR LABELS FOR TAPES. LIST BY TAPE NO./FILE NAME. DATA SAVED INCLUDES : TITLE, START/END, LENGTH, PLUS CATEGORY.

CABLES & ETC.

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THE $ SAVER SWITCH CONNECTS TWO COMPUTERS TO ONE PRINTER OR DISK DRIVE. BETTER YET, SHARE YOUR DRIVE AND PRINTER BETWEEN TWO COMPUTERS, LINK 2 PRINTERS TO ONE COMPUTER. FLIP A SWITCH FROM ONE DEVICE TO ANOTHER. NO ALTERATIONS OR EXTRAS NEEDED, PLUGS IN IN SECONDS.

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CRUNCHMAN

For the C-64

By Roy D. Lewis



Crunchman is an extremely fast *Pac-Man*-type arcade quality game for the Commodore 64. Sounds and music are included in the game screens. When the game has been loaded you are greeted with a title screen giving you the Ghosts' names, GOOLY, GOOKY, COOLY, and COOKY, and the scoring amounts. The Ghosts are displayed on the title screen and scroll up the screen in sequence. The border color changes to match the color of the ghost currently scrolling.

Pressing the space bar starts the game at Level 1 with three lives. You, as Crunchman, appear in the center of a maze, with the ghosts in the four maze corners...but not for long. The ghosts move in all directions at varied speeds, and are out to get YOU. If they do, you lose a life. Fortunately, there are four red power-pills, one in each screen corner. Crunching one of these allows you to crunch the ghosts, but only as long as the crunching siren lasts. Beware, for as soon as you have this crunching power, all the ghosts increase their speed to escape from you. When a ghost is crunched it disappears, only to reappear in center screen a little later, so be very careful when you cross this area.

Points are also gained for each white spot on the screen. You must crunch all the spots in order to advance to the next level of play. The second and third levels give you the bonus strawberry, and higher levels give you the cherries. Both of these bonus-giving crunchies are blocked until you have crunched some of the white spots.

On the left and right side of the screen are openings which allow you and the ghosts to move through to the other side of the screen. So be very wary of hanging out there when a ghost decides to cross through from the other side. By the way, watch out for the Green Ghost,

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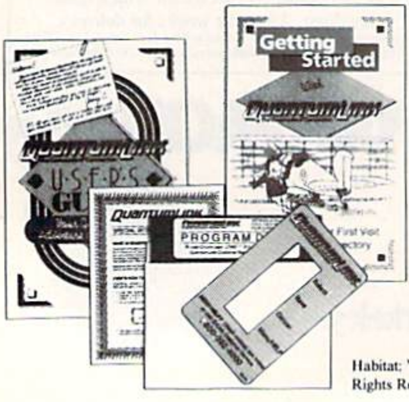
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who has a habit of getting in your way (but only when you do not have crunching power).

The program is written in three parts, but when you have finished typing and have saved all three, parts two and three will be made into a hybrid program. Start off by typing in the first listing on page 102 and saving it as CRUNCHMAN1 to tape or disk. *Do not run it yet.* Remember to change the 8 to 1 in line 185 of the listing if you are using tape. Next clear memory by typing NEW and then type in the second listing, being extremely careful not to change *anything*, not even a space. Before you save it, list it onscreen, then type PRINT256*PEEK(46) +PEEK(45). You *must* get 6200; if you do not, you will need to recheck your program, make the corrections, and try again. Save the program as CRUNCHMAN2, *only* when this is correct.

Now type in the third listing, using *Flankspeed* (see page 101). The starting address is $1836 and the ending address is $1CBF. When you have a saved copy of all three programs on disk or tape, you have one very important thing left to do (described in the following paragraph). This will convert the second listing to a hybrid program by joining listing 3 to the end of it. Once this has been done you will have a truly professional top quality arcade game...fast, mean, and addictive.

Clear the computer's memory by SYS64738 and load the second listing with LOAD"CRUNCHMAN2",8 or 1 for tape. *Do not run it.* Now type (as a check) PRINT256* PEEK(46)+PEEK(45). You should get an answer of 6200. Leave this on the screen and type LOAD "CRUNCHMAN3",8,1 (do not forget the 1 as this ML program must load into the correct location, which of course starts at 6200). When this has been loaded and you get the ready prompt, cursor up until you are over the PRINT256*PEEK(46)+PEEK(45) and press return. The 6200 should change to 7359. Now save this hybrid program by SAVE"@0:CRUNCHMAN2",8 (no ,1 is required). Those who are worried about Commodore's "@0:" bug(?) can type OPEN15,8,15 + RETURN and then PRINT#15,"S0:CRUNCHMAN2" and then CLOSE 15 and then SAVE"CRUNCHMAN2",8. Tape users need only save the hybrid program over the original.

Now you are ready to try your crunching skills. Do not scratch CRUNCHMAN3 yet; wait until you have tried out the game. Type NEW and LOAD"CRUNCHMAN1",8: (use the colon at the end if you are using disk) and press SHIFT/RUN STOP instead of RETURN. The program will now load and run, loading and running *Crunchman2* for you automatically. □

SEE PROGRAM LISTING ON PAGE 102



Are you a hacker at heart? After typing in a game program, do you get more pleasure from modifying the game than from playing it? When you boot up your computer, do you normally load a handful of favorite utilities to configure the computer just the way you want it? Do you ever spend hours fine-tuning a program until it "feels" just right?

If you answered yes to any of these questions, then you have the characteristics of a hacker. There are numerous connotations, both good and bad, of the term "hacker." Here we mean "software tinkerer" or "bit twiddler." We will not discuss the use of modems to break into the Strategic Air Command's Defense Communications System. Nor will we delve into "busting" the latest copy protection schemes. Our goals are more modest but true to the spirit of hacking.

This month we will start with a BASIC "loader" program which puts a machine language utility into memory. We will use the machine language monitor to explore this utility as it resides in memory. We will disassemble the utility to figure out how it works. Finally, we will see what is required to move the utility to a different location in memory. Why do this? Simply because it's there.

THE LOADER

You have seen those machine language loader programs many times before. They are written in BASIC, and they consist mainly of DATA statements filled with decimal or hexadecimal numbers. Have you wondered about the significance of all those numbers?

To fully understand them, you must know something about assembly language. Unfortunately this article cannot teach assembly language in one easy lesson. Nevertheless, you don't need to be an assembly language expert to follow this discussion. This will be a lesson in what to look for in an assembly language program and how to find some answers.

The utility loader is called *String Loader* (see page 114). It is written for the C-128, but slight modifications will let it run on the C-64 as well. One of the changes we will discuss will let you modify the program for the C-64.

Line 1050 puts a byte of data B into memory location M. Initially M is 4892 in line 1000. The first byte of data read from line 1100 is $4C. (Numbers preceded by $ are hexadecimal values. Others are decimal.) CK in line 1040 adds all the data values together to form a "checksum." Once the last data value ("XX") has been read, the checksum is compared with the correct value to ensure that all DATA statements have been typed properly. If they have been, line 1090 is executed and states that all is well.

At this point, the 32 bytes of data have been put into memory starting at address 4892. This data is a machine language utility which can be called from BASIC. The purpose of this utility is to print a specified number of identical characters on the screen. The STRING utility is equivalent (except in speed) to this BASIC routine:

ing

By Dale Rupert



T.J. ZYGAROWICZ

BREAKING INTO MACHINE LANGUAGE UTILITIES

```
10 CH=65 : N=500
20 FOR J=1 TO N
30 PRINT CHR$(CH);
40 NEXT J
```

CH is the ASCII value of the character to be printed. N is the number of times the character is to be printed. The FOR-NEXT loop does the printing. In this example, the letter "A" which has an ASCII value of 65 is printed 500 times on the screen.

Once the *String Loader* program has been successfully run, it leaves a machine language program in memory starting at address 4892. Your C-128 BASIC program can execute the ML program with these statements:

```
10 CH=65 : N=500
```

```
20 MSB=INT(N/256)
30 LSB=N-256*MSB
40 SYS 4892,CH,LSB,MSB
```

Lines 20 and 30 convert the value N, which may be as large as 65535, into two one-byte quantities, each between 0 and 255 inclusive. The variable CH stores the ASCII code of the character to be printed N times.

The SYS statement causes the computer to jump to address 4892 and to begin executing the machine language program there. The first parameter following the SYS command represents the starting address (4892) of the machine language routine. The next three parameters are values to be stored in the A register, the X register, and the Y register of the processor before the machine language routine is executed.

Assuming that all of this is new to you, let's discuss starting addresses and registers. In BASIC we use the GOTO or GOSUB statements to change the sequential flow of a program. We refer to specific instructions in BASIC by means of their line numbers. When the computer executes a GOTO 100 statement, it jumps to line 100 for its next instruction. We don't know or need to know where line 100 is in the computer's memory. It is part of BASIC's task to find line 100 in memory. BASIC is called a "high level language" since it isolates the programmer from such rudimentary tasks as keeping track of where things are stored in memory.

The SYS statement is the gateway to a low level language. When BASIC sees SYS 4892, it causes the microprocessor to jump to memory address 4892 for the next instruction. The processor does not find any PRINT, GOTO, or other BASIC statements there. Instead the processor finds instructions that it can execute on its own, without any help from the BASIC interpreter program. We will see examples to clarify this shortly.

We saw that the SYS command put values into the A, X, and Y registers before the computer branched to address 4892. Registers are read-write storage locations within the microprocessor, similar to the memory function on a hand-held calculator. On the C-64, a BASIC program must POKE values for the A, X, and Y registers into memory locations 780, 781, and 782 (see page 318 of the *C-64 Programmer's Reference Guide*) before executing the SYS command. On the C-128, the register values are part of the SYS command.

MACHINE LANGUAGE

Before we get into the machine language, here is a tip if you have trouble. Read or reread Chapter 5 in either the *C-64* or the *C-128 Programmer's Reference Guide* (referred to as the *PRG*). This chapter gives a good overview of assembly language and the innards of the computer. The *PRG's* are not the clearest or the best-organized books, but they provide essential and useful information. No true hacker would be without one.

Probably the most difficult aspects of machine language are the mathematics (binary and hexadecimal) and the

addressing modes. An assembler program relieves some of the mathematical burden in writing machine language programs, but not all of it.

Concerning the addressing modes, nothing short of time and practice will make you fully understand them. Don't worry about their names. The important thing is their function. Knowing that LDA ($3A,X) is called "indexed indirect addressing" is not nearly as important as knowing exactly where the A register is being loaded from with this instruction.

If you are using the C-64, you should change line 1030 to GOSUB 2050 to replace the C-128 HEX command. Also note the lines beginning at 2000 which must be added for the 64. With the 64, the steps to get started are:

1. Load and modify *String Loader* as described above.
2. Execute *String Loader* by typing RUN.
3. Load and run your machine language monitor program (such as *Supermon64*).

The STRING utility will usually not work in the C-64 at address 4892 where it is now. BASIC programs may interfere with it. For the following discussion, we are just looking at the program in memory and not trying to execute it. Later we will see what is needed to move the program so that it can be used on the C-64.

On the C-128, run *String Loader* and then enter MONITOR (press f8 unless you have redefined it) to begin investigating the STRING utility.

Where do we begin? We know that the routine is loaded into memory starting at 4892 ($131C). Let's start by disassembling at that location. Type D 131C (or the equivalent disassembly command for your monitor).

The first instructions of the STRING routine we see are

```
JMP $1324
EOR ($48,X)
???
EOR $E021,Y
```

That unknown command ??? looks puzzling at first. Is this really an executable program? Our first clue as to what this routine does is the JMP instruction. It causes the processor to unconditionally jump to address $1324. Now the explanation for those EOR (exclusive-OR) instructions and the unknown instruction is clear. Those bytes are probably just data values, not really instructions. The computer doesn't execute them. It jumps right over them. Before we verify that assumption, let's disassemble some more.

This time, we start disassembling at $1324 since that is where the JMP instruction goes. What we see now looks like a real program. How can you tell? Experience helps, but for one thing, there are no unknown bytes. Also there are some JSR instructions to address $FFD2. At this address is one of the built-in Kernal routines.

These Kernal routines are a collection of ready-to-run machine language routines. They are frequently used in machine language programs.

Refer to *Screen Dump 1* on page 97 for the following discussion. Looking through this screen dump, we see an RTS instruction at address $133B. The RTS instruction is equivalent to the BASIC RETURN statement at the end of a subroutine. This could be the last instruction in the STRING program.

To find out, look at the BEQ and BNE (branch if equal and branch if not equal) instructions. The branch instructions are conditional jump instructions. The program branches if certain flag bits in the processor's status register are set (1) or reset (0) by previous instructions. None of the branch instructions go to addresses beyond the address of the RTS instruction. Therefore the RTS is indeed the end of the program.

Another way to identify the end of the program is to realize that *String Loader* put 32 bytes into memory, and RTS at $133B is the 32nd byte.

Disassembling a program is not difficult. Interpreting the disassembly can be tough. Again, experience counts. This little routine is not too bad to interpret, however. Take the first two instructions starting at $1324:

```
CPX #$00
BEQ $132E
```

The first instruction compares the X-register with zero. If the X-register equals zero, the Zero flag in the processor is set, otherwise it will be reset. the BEQ (Branch if EQual to zero) instruction jumps to $132E if the Zero flag is set.

Recall that our BASIC calling program puts values into the A, X, and Y registers. If the X register starts with a value greater than zero, the program executes these instructions at $1328:

```
JSR $FFD2
DEX
BNE $1328
```

This is equivalent to a FOR-NEXT loop in BASIC. The subroutine at $FFD2 is called, the X register is decremented, and if it is not zero, BNE (Branch if Not Equal to zero) causes the program to loop back to call $FFD2 again. Consequently $FFD2 is called X times, where X is the initial value in the X-register.

Once X equals zero, these instructions at address $132E are performed:

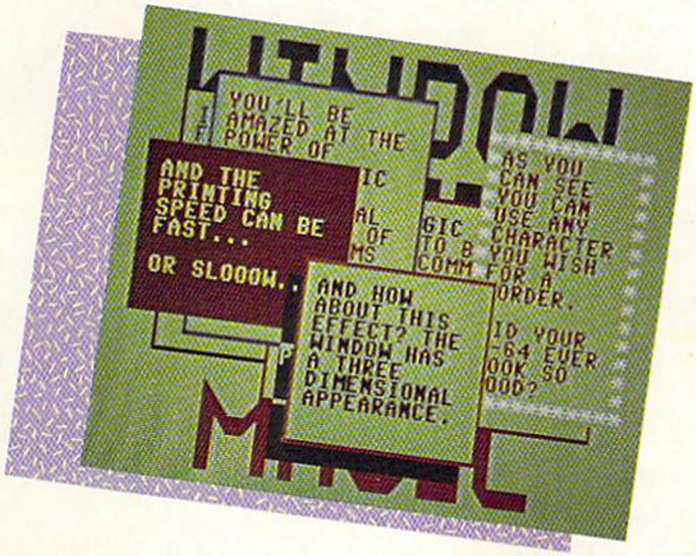
```
CPY #$00
BEQ $133B
```

Continued on page 97

WINDOW MAGIC

For the Commodore 64

By Richard F. Daley, PhD and Sally J. Daley



Recently, while browsing in a computer store, I saw a demonstration of windows on a computer. I was amazed, enthralled, spellbound. Perhaps, I thought, the time had come to retire my little C-64 so the new computer with the magical windows could take its place. Then I looked at the price tag. Gulp! For that price I would give my 64 some magical windows of its own. Hence the program *Window Magic.*

First, type *Window Magic* (on page 115) into your Commodore 64. Since it is a machine language program, you must use *Flankspeed* (see page 101) to enter and save a copy onto tape or diskette. When you have finished entering *Window Magic* and have saved a completed copy, use

```
LOAD "WINDOW MAGIC",1,1
```

to load from tape or:

```
LOAD "WINDOW MAGIC",8,1
```

to load from diskette. When *Window Magic* is in the computer's memory, type NEW followed by SYS 49152. You have now added 11 new commands to your BASIC repertoire.

Warning: Just like the BASIC commands already available with your Commodore 64, *Window Magic* converts each of its commands to tokens. However, this means that your computer will not know what to do with these tokens unless *Window Magic* is in memory. When LISTing, LOADing or RUNning a program containing *Window Magic* commands without *Window Magic* in memory, anything can happen from a SYNTAX ERROR to a computer lockup. Thus, do not LOAD, LIST, or RUN a program with *Window Magic* commands in it without first loading *Window Magic.*

Patience is a virtue possessed by very few computer programmers. So I know what you're saying: "Let me see it work." Enter the following line on the computer:

```
A$="THIS IS MY FIRST WINDO
W MAGIC COMMAND!":WINDOW(1
,A$)
```

You should see a window appear near the center of the screen. It will take about one second to "grow" from a small square to its full size. Then the words contained in the variable A$ will appear. This is called 'opening' a window. If you watch carefully you can see the computer try to fit the word "FIRST" on the first line of the window. As the word will not fit, it is erased and moved to the second line of the window. This is called word wrap. Word wrap occurs only when you have a word too long to fit on one line in a window.

Don't clear the screen just yet. Type the command:

```
WINDOW(3)
```

WOW! The window just disappeared, leaving the screen as it was before. This is called "closing" a window. Before opening a window, whatever is on the screen is saved, so that it will reappear after the window is closed. Try using these two commands as often as you wish. Fun, isn't it?

To get the full impact of the possibilities of *Window Magic* and to better understand the directions on using the commands, type in the demonstration program on page 118. Study this program, as it contains many examples of using windows.

COMMAND DESCRIPTIONS

Many of the 11 window management commands in *Window Magic* require parameters. For consistency, these parameters must be enclosed in parentheses. Any of the numeric parameters can be an integer or numeric variable and must be positive—a negative value will generate a SYNTAX ERROR. In addition, you can use any numeric expression (such as X*2+Y) that is supported by BASIC. The only requirement is that these expressions be enclosed by parentheses, such as (X*2+Y). Values which are not within the required range will generate an ILLEGAL QUANTITY ERROR. Also, if you omit any numeric parameters from a list, any val-

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ues specified for a previously defined window will be used, except with the WINDOW command. Whenever you open a window, the current screen is saved on a Last In First Out (LIFO) stack.

Once *Window Magic* is installed, you need only enter the commands. However, there is one peculiarity. When you use one of the new commands described below following an IF-THEN statement, you must precede it with a colon. For an example, see line 250 in the demonstration program.

Now, let's have some fun! Type in the following program. As you are doing so, try to analyze what it will accomplish.

```
100 RESET
110 WSIZE(10,10,6,12)
120 WPARM(1,1,0,32,40,40)
130 A$="THIS IS"+CHR$(13)+
"A TEST."
140 WINDOW(1,A$)
150 GET T$: IF T$<>" " THE
```

TABLE OF WINDOW MAGIC COMMANDS

WSIZE (row, col, hgt, wid)

The WSIZE command defines the size and position of a window. Any parameters not defined remain as previously defined. This can mean either the values automatically assigned on LOADup of *Window Magic* or the last window you defined. The values assigned by *Window Magic* are row 5, col 11, hgt 14, and wid 18.

row—The vertical position of the window.

col—The horizontal position of the window.

hgt—The vertical size of the window.

wid—The horizontal size of a window.

All values of WSIZE must be positive. The value of row plus hgt must be less than 25, while the sum of col plus wid must be less than 41. Both row and col define the placement of the upper left corner.

WPARM (shado, color, bchar, ichar, gro, prt)

Here you determine many of the parameters for the visual appearance of the windows. Any parameters not defined remain as previously defined. Again as with the WSIZE command, this can mean either the values automatically assigned on LOADup or the last window you defined. The values assigned by *Window Magic* are shado 1, color 1, bchar 0, ichar 32, gro 40, and prt 40.

shado—A flag used to determine whether or not to give the window a three dimensional effect. A value of 1 gives the window a shadow, while a value of 0 does not.

color—The color used for both border and the interior of the window. In this case the border is a simple outline.

bchar—Character used for the border. You have the option to change the assigned border to any character available on the Commodore 64. Since the characters are POKEd into the screen memory, you must use the screen display codes (Appendix B in the *Programmer's Reference Guide*) instead of the program codes (Appendix C). Enter a 0 here to maintain the assigned window border.

ichar—Character used for the internal background character of the window. Usually you will use values 32 (space) or 160 (reversed space), however, any value between 1 and 255 may be used. Again as with the bchar option, because the characters are POKEd into the screen memory, you must use the screen display codes (Appendix B in the *Programmer's Reference Guide*) instead of the program codes (Appendix C).

gro—The rate of growth for the window itself. A value of 1 is fast, while a value of 255 is quite slow.

prt—The rate of printing within the screen. A message is printed quickly with a value of 1, while with a value of 255 it is very slow.

WINDOW (opr, string)

This command allows you to open, close, or reuse a window, and to assign a string (the information to be displayed within the window) to that window.

opr—Specifies which option is to be used by the WINDOW command. If WSIZE and WPARM are not specified before opening a window, then the window is opened with whatever parameters were previously used.

1. Open a window and display the string. Also, this option causes the screen (before opening the window) to be stored on the LIFO stack. Because of memory limitations you can have only eight windows open at a given time. Opening windows subsequent to the eighth simply replaces the eighth at the top of the stack.
2. Reuse a window and display the string. The window is cleared before displaying the string.
3. Close the window. The string parameter is not required and, if specified, will be ignored. The top screen of the LIFO stack is moved to the display memory.

string—A collection of characters to be printed in the window. The rules are much like those for a PRINT command, except that the string must be either a variable or a literal string and be enclosed in quotes. Strings may not be concatenated (joined) within the WINDOW command. If a string won't fit in a window, any parts that don't fit are ignored.

DISPLAY (string)

While this option is similar to option 2 of the WINDOW command, here the string is printed in any available space on the first free line of the window following any messages printed there.

MENU (entries, string, select)

This command is a multiple use command. It opens a window and

```
N 150
160 SCROLL(3,2)
170 FOR I=1 TO 4:SCROLL(I,
2)
180 FOR J=1 TO 20: NEXT J:
 NEXT I
190 GET T$: IF T$<>" " THE
N 170
200 WINDOW(3)
```

Before reading any further and before seeing this program in action, study it to understand its operation.

When you think you understand what happens, RUN the program. Surprised? If so, go back and look at the program again. Also study the demonstration program carefully to get some hints as to how the various commands work.

Important note: due to conflicting memory addresses, to check *Window Magic Demo* with *Bug Repellent*, you must save *Window Magic Demo*, reset the computer, and load and run *Bug Repellent*. Then load *Window Magic Demo* and SYS 49152.

SEE PROGRAM LISTING ON PAGE 115

TABLE OF WINDOW MAGIC COMMANDS (CONT'D)

displays a string, as does option 1 of the WINDOW command. However, the string displayed is a menu with each line, except for the first, being a menu option. After the menu is displayed, the computer waits for you to select one of the menu options.

To select an option, use the cursor up/down key to position the marker beside the option you want to choose. When the marker is properly located, press the RETURN key. The marker then changes to an asterisk (*) and waits for four seconds. If you do nothing, the selection is acted upon at the end of the delay. If you press the Y key, the selection is immediately acted upon. If you press the N key, you are returned to the menu selection mode. When you select one of the entries, the menu window closes and the number of the option selected placed in the select variable.

entries—The total count of the number of entries in the menu. The count can be any number from 1 to 20.

string—The characters, in the form of a menu, to be displayed in the window. The rules for options 1 and 2 of the WINDOW command also apply here. When planning the string for the window, the MENU command expects the first line to be a title—it cannot be used as a menu entry. All subsequent lines up to the number of entries specified are treated as menu entries. Also the first column in a menu window is reserved for use by the moving marker. If you do not print a space at the beginning of each menu line, the first character of your menu entry will be lost.

select—A numeric variable to hold the selection number. This returns a number between 1 and the maximum number of menu entries. This numeric variable must be a standard floating point variable. Do not use an integer variable or an array variable.

CLW

Use this command to erase the contents of the current window.

RESET (scrn)

With this command you change the stack pointer to the LIFO stack to whatever value is specified by scrn. Because the LIFO stack concerns itself with only the last window used, this allows you to return to a previously used window. Possible values for scrn range from 0 to 8. If scrn is specified as zero, or omitted, then the stack is cleared. The numbers 1 to 8 are pointers to their respective windows. Care must be used here. If you enter a value higher than the number of windows contained in the stack, you can get garbage on your screen when you use WINDOW (3). It is recommended that you begin every program containing *Window Magic* commands with a RESET or RESET(0).

STORE

Save the current screen on the LIFO stack. When you open a window, the screen is automatically stored on the LIFO stack, whereas STORE allows you to store a screen on the stack without opening a window. Storing more than eight screens on the stack means that any screen after the eighth screen replaces the eighth on the stack.

A possible use here would be for a simple animation. Create eight frames in a sequence, and store them on the stack. Then play the animated scenes by using a RETRIEVE or WINDOW(3) command. Remember when creating the screens, plan them to be viewed from the last one designed to the first one designed (Last In First Out). When all eight scenes have been played, RESET(8) to begin again.

RETRIEVE

Pull the top screen from the LIFO stack and move it to display memory.

SCROLL (dir, amt)

With this command you scroll the contents of the window in the direction and by the number of lines specified.

dir—Direction of scroll. A value of 1 scrolls the contents up, 2 to the right, 3 down, and 4 to the left.

amt—Number of rows (or columns) to use in the scroll. If the amt is not specified, then the default is 1.

BOX

This is the last command which relates to windows. It draws a box on the screen with the size and color as specified by the last WPARM and WSIZE commands. It does not save the current screen in the LIFO stack before drawing the box.

COLOR (txt, border, bkgnd)

Bonus! Using this command allows you to easily set the colors of both text and screen. All three of these values need to be between 0 and 15.

txt—Set the color of the text.

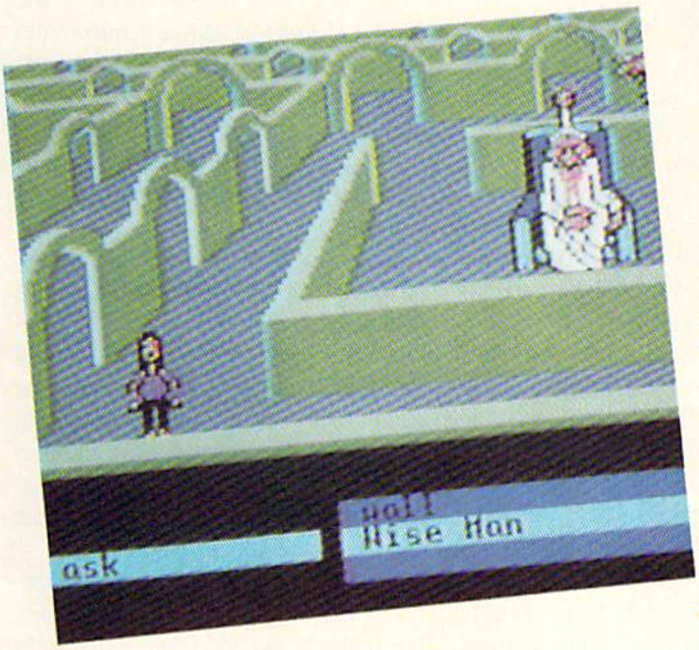
border—Set the color of the border of the screen.

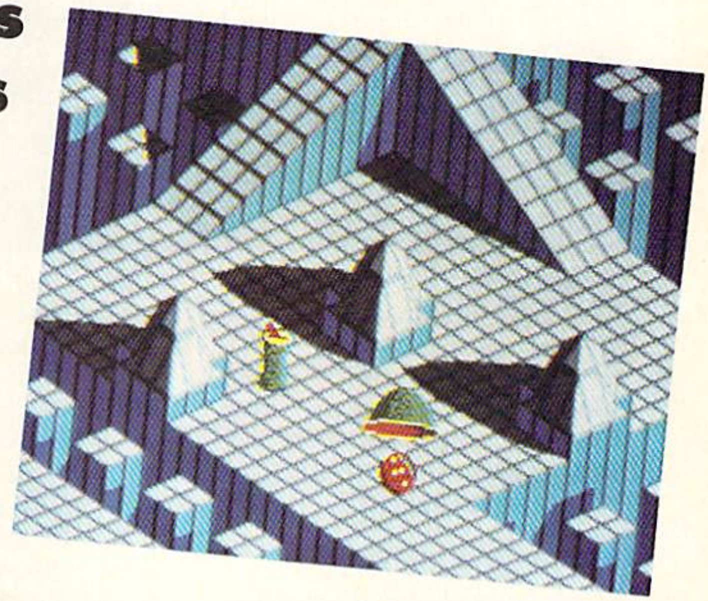
bkgnd—Set the color of the background of the screen.

Son of License Boom

The Pendulum Swings Back to Tie-In Games

By Arnie Katz and Bill Kunkel





Design of Labyrinth *(left) is sometimes misguided, mostly on target.* *READER SERVICE NO. 161*

Depth of graphics in Marble Madness *(above) is remarkable.* *READER SERVICE NO. 162*

Like a jilted suitor who pouts at the merest mention of his old flame, entertainment software companies have shunned license-based products since the Great Videogame Shakeout of 1983. Artistic and financial flops such as *ET, M*A*S*H, Flash Gordon* and *Journey's Escape* put more than one videogame cartridge manufacturer out of business and poisoned the market for programs based on concepts first developed in other media.

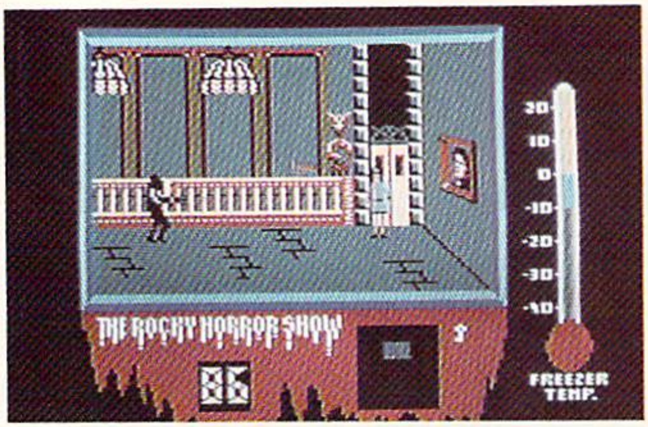
Games derived from licenses, comparatively rare in 1984 and early 1985, became more plentiful last year. *Spy vs. Spy* (First Star), *Ghostbusters* (Activision), *Larry Bird and Julius Erving Go One on One* (Electronic Arts), *Bruce Lee* (Intellicreations), and *BC's Quest for Tires* (Sierra) grabbed both critical kudos and big sales dollars, and their success has paved the way for other licensed games. *Star Trek: The Kobayashi Alternative* (Simon & Schuster) and *The Fourth Protocol* (Bantam) are only two of last year's best sellers which sprang from tie-ins with properties originated in other media.

The question of whether it is bettter to create a totally original concept for a game or adapt a proven idea from another source has no definitive "right" answer. The entertainment software field does not exist in isolation. It is only one form of popular culture among many. Artistic cross-fertilization is an essentially healthy process, even if the specific results of the interbreeding sometimes leave much to be desired.

When a publisher ponders the economics of a license, the chief question is whether it can generate enough extra sales to make up for the cost of the license. The price of a license is frequently higher than the combined expense of the actual design and programming, and it's common for companies to defray some of this extra overhead by trimming the advances and royalty shares for the design/development team. Therefore, the sales potential must be high or the manufacturer may find it hard to put together a good crew to execute the project.

Featured This Month:

If software history teaches anything about licenses, it is that a good property is not synonymous with a good game. Too often, companies have spent heavily for popular licenses without really considering the game-



An especial treat for fans of the movie, **Rocky Horror** *remains true to its celluloid source without straitjacketing gamers with a linear plot. READER SERVICE NO. 163*

design consequences.

Licensed software is divisible into four general categories:

1. Home computer versions of existing games. *Monopoly, Scrabble, APBA Baseball, Gulf Strike,* and many other games have made the successful transition to the home computer.

2. Games based on books. *The Fourth Protocol* (Bantam Electronics), *Robots of Dawn* (Epyx), and *Hitchhiker's Guide to the Galaxy* (Infocom) are but three of many computer games inspired by novels.

3. Games based on cartoons, comic strips, and comic books. *BC's Quest for Tires* (Sierra), *Moebius* (Origin Systems), and *Spy vs. Spy* (First Star) are positive examples.

4. Games based on electronic media (movies, radio, and television). *"Star Trek"* (Simon & Schuster), one of the biggest adventure hits in the last two years, demonstrates how well a video-oriented license can work in a game context.

In addition, there are a couple of types of licenses which don't fit comfortably into any of these four niches: sports licenses and character licenses. Typical of the former variety is certification by major league sports groups to emphasize the authenticity of the associated game. The latter includes games based on toys such as *Barbie* (Epyx) and those in which the game has only the most tangential connection with the license it invokes, such as *Frankie Goes to Hollywood* (Firebird).

Anxious to break through the 100,000 unit sales barrier with consistency, publishers are carefully scrutinizing every potential licensing source in their search for time-tested appeal. Let's look at the latest batch of licensed game releases.

Marble Madness (Electronic Arts), the long-awaited translation of the coin-op cult classic, offers fresh evidence that the commercial arcades can still be a source of computer gaming concepts. At one time, microcomputer software manufacturers prowled the coin-op shows like hungry tigers, hunting for quarter-snatchers that they could quickly turn into hits for the home screen. *Space Invaders, Pac-Man, Buck Rogers, Congo Bongo, Donkey Kong,* and *Jungle Hunt* are only a few of the designs which made their debuts in the arcades and then proved at least as popular with owners of microcomputers.

Many believed, wrongly, that the coin-op connection broke down about the time that the coin-op bubble burst, and most adults stopped going to the electronic fun centers. In truth, few coin-ops suitable for the home market saw the light of day during the last three years. Most of the coin-op designs during this period consist of a relatively simple play-mechanic clothed in glorious graphics. Home game publishers knew they couldn't match the visuals, and that computerists would rapidly tire of the simple, repetitive action without such eye-catching distractions.

Marble Madness is typical of the exciting action-strategy contests which now dominate the family amusement centers. While the coin-op's graphics are certainly easy on the eyes, the guts of the game would still be interesting even if the onscreen art wasn't as arresting.

Marble Madness is a computerized permutation of the "labyrinth box," a wooden rectangle with a maze on a surface which can be tilted in different directions by twisting a pair of knobs. The object is to propel a steel ball through the tangle of corridors without letting the ball fall into one of several dozen holes.

Instead of a tilting surface, the *Marble Madness* player controls the ball itself. The three-dimensional mazes look like something Albert Einstein might have created under the influence of mind-altering drugs if left alone with the world's largest Lego set.

The obstacles are a lot less prosaic than a bunch of holes. There are green slinkies which pursue and destroy the player's piece, and enemy balls that can bang and batter the player's sphere right off the edge, into the great abyss. The greatest danger, however, are the centrifugal pits, narrow pathways, sharp turns, and short ramps of the maze itself.

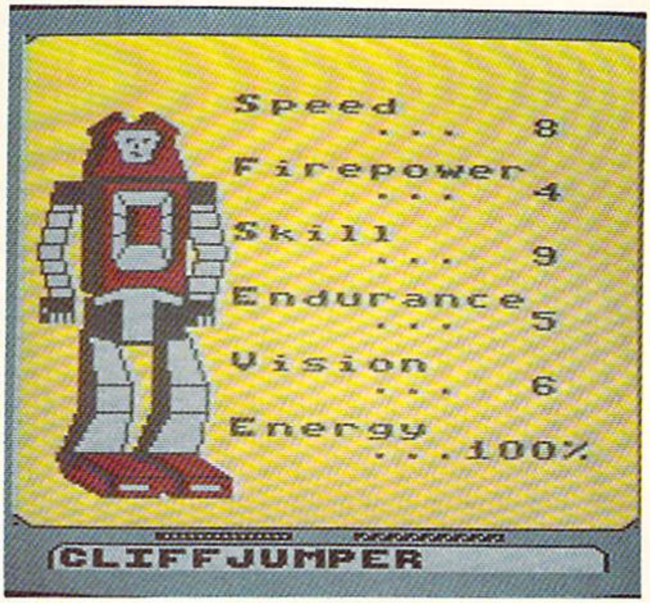
Players begin with a novice maze. Unfortunately, *Marble Madness* can't be set to the desired level of playfield prior to the start of play, so gamers will have to endure the tutorial round long after it has ceased to instruct. The second level is much harder, and by rack three, even skilled joystick jockeys may be ready to cry "uncle."

The depth and texture of the graphics are remarkable. The dimensions of the mazes are readily apparent to the player at all times, and the player should be able to follow the ball without difficulty.

Control over the rolling ball isn't always tight, and a joystick is not the ideal controller, but *Marble Madness* easily overcomes these obstacles with absorbing action. It ranks as a major achievement in spite of its minor weaknesses.

Movies into Games

The process of turning a movie or television show into a game is pockmarked with pitfalls. For instance, what happens to the game if the movie on which it is based draws jeers



Transformers ***fails because it glosses over the basis of the robots' main appeal: their ability to change form. The metamorphoses are only incidental to the game, and cannot be initiated by user command.*** *READER SERVICE NO. 164*

instead of cheers? Another serious issue is how closely the game should emulate the storyline of the movie.

Labyrinth: The Computer Game (Activision), the computer version of the Jim Henson-George Lucas summer movie flop, may shed light on both these issues. Though not well-received, the film was an interesting attempt to capture the excitement of dungeon exploration contests. That should have made it the perfect vehicle for a computer game translation, especially considering the fact that Lucasfilm's own design group developed the software.

On the whole, the design of *Labyrinth* is sometimes misguided, but mostly on target. It blends an action-oriented dungeon quest with the more sophisticated elements of the text adventure genre.

The player guides a male or female character through the film's megamaze. The electronic surrogate meets some unusual beings, falls through trapdoors, and generally has a more varied set of experiences than in the average graphic adventure.

Though the joystick governs ordinary movement, many situations arise which can't be handled with zigzag running and a timely jump. At these times, the player employs the pair of windows located at the bottom of the screen. They present menus of verbs and nouns which are suitable for the current situation.

Unfortunately, the designers' powers of invention failed them when they concocted the laborious, pointless, and illogical opening scene. The computerist must enter a series of rather arbitrary verb-noun commands to get the protagonist to the movie theater so the game can begin when Jareth the Goblin King invites him or her into the action.

To get to the point at which the fun begins, the player must do several silly things, like bring a camcorder into the theater and complain, twice, about the popcorn. Lack of internal logical consistency has ruined more than one adventure game, and it's hard to imagine anything less likely to happen than a theater letting one of its patrons enter with a video recording device.

The main display shows a side view of the dungeon and the well-drawn character. Below this on the screen are the verb-noun windows and a bar which indicates the location of doors and objects. The figures are large and well-animated, and all the film's characters (Hoggle, Jareth, Sir Didymus, Firey, Alph, Ralph, et al) are instantly recognizable.

Those who have seen the movie have a great advantage, but no puzzle is so difficult that a clever gamer can't penetrate its secrets through skillful manipulation of the program's innovative interface. The frustrating opening sequence makes a poor prelude to the delights of *Labyrinth: The Computer Game,* but those who press forward are likely to enjoy the fast-paced adventure which takes place within its byzantine walls.

"The Rocky Horror Show" began life as a British stage play, moved to the US, and eventually inspired a film version, "The Rocky Horror Picture Show." The movie became a cult classic, the most successful "midnight movie" of all time. It employs the gender-bending and blatant sexuality of the underground cinema to broadly satirize the cliches of horror and science fiction films.

Richard O'Brien's Rocky Horror Picture Show (Electric Dreams) is a tongue-in-cheek romp that remains remarkably true to its inspiration without straitjacketing the gamer with a linear plot. All of the infamous characters are here: Frank N. Furter (the Mad Doctor to end all Mad Doctors), Riff-Raff (the butler, whose lithium prescription has clearly run out), Magenta (Riff's steamy sister and the housekeeper), Columbia (the manic groupie), Rocky (the Monster of Frank's dreams), and Eddie (Columbia's lunatic biker boyfriend, Furter's early, failed experiment). This explore-the-rooms contest thumbs its nose at all those other explore-the-rooms contests while being, itself, a fine example of the genre.

Prior to actual play, the computerist decides which character to control: Brad Majors, the upright, uptight all-American boy, or that hopeless airhead, Janet Weiss. As the game opens, the car has broken down in front of the sinister mansion on Frankenstein Place. Once Brad or Janet enters, the screen shows a slightly angled side with horizontal scrolling. The mansion has two floors, and upstairs can be reached either by the stairs or one of two elevators. There are also plenty of rooms, most of which are dangerous.

Most of the denizens of this wacky residence, it seems, are actually aliens from the planet Transylvania, here for some sinister purpose, and they don't intend to let you go. Moreover, the bent Dr. Furter is planning

on adding both Brad and Janet to his list of experimental subjects—like poor Eddie down in the deep freeze! The only way out is to collect the pieces to the De-Medusa machine and reconstruct it in the theater, where your pertrified mate is propped up on the stage.

Unfortunately, the gamer's character can carry only one item at a time, and the De-Medusa is in lots of pieces. Worse still, the crackpot Transylvanians are terrible hosts who steal Brad/Janet's clothes and possessions if given half a chance. It's hard to feel very heroic when your character is prancing around the mansion in his or her underwear.

Dangers and distractions abound. Riff-Raff wanders around with a deadly zap gun, Magenta makes rude remarks, and Eddie is defrosting in the basement. When the temperature, as indicated on a thermometer to the right of the main display, hits the melting point, he comes roaring upstairs like the proverbial bat out of hell. "Time Warp," the catchiest of the tunes in the movie, plays in the background.

Rocky Horror Picture Show is an especial treat for fans of the play/movie, but any gamer with a sense of humor should get off on this delightfully demented action-adventure. Let's do the Time Warp again!

Comics on Computers

Animated films, comic books, and comic strips have inspired several outstanding computer games. Videogames like *Superman* (Atari) and *Smurf Rescue* (Coleco) paved the way for such computer software winners as *Donald Duck's Playground* (Sierra) and the two *Spy vs. Spy* programs by First Star.

Many of the recent attempts to render comics and cartoons in game form have met with disaster. Adventure International did not survive the failure of the first two titles in its Marvel Superheroes series, First Star's *Superman* signaled the company's demise as a publisher, and *Transformers* (Activision) is, to twist the original's motto, "less than meets the eye."

David Crane, whose string of achievements includes *Pitfall* and *Ghostbusters*, stubs his toe with this action strategy contest for preteens based on the hugely successful Transformers cartoons and toy line. The game misfires because it glosses over the basis of the Transformers' main appeal: the ability of the good Autobots and evil Decepticons to change form. It will be hard for a youngster immersed in Transformers to accept the fact that metamorphoses are only incidental to the game and cannot be initiated by user command!

Stopping the Decepticons' plot to drain Earth's energy resources involves action on both the strategic and tactical level. The player has a force of eight Transformers which may be dispatched to any of nine likely Decepticon targets. When a robot is sent, a canned animation shows it transforming into a vehicle. When an Autobot reaches the desired location on the map, the gamer can hit a key to switch to the individual Transformer's first-person view of the site.

In the tactical portion of the game, the computerist uses a joystick to move a cursor and shoot at any Decepticons on the screen. The enemy automatons aren't very good at taking evasive action, though they move fast enough to make aiming challenging. A "barrage" option allows the gamer to anticipate the flight paths of the Decepticons and improve the chances of hitting these streaking foes.

The audiovisual effects are only so-so. The insanely catchy theme song keeps events moving at a brisk pace, but some of the sound seems a little muddy. Though there are lots of playscreens, the illustrations are more notable for their quantity than their quality.

Though *Transformers* is not without its charms, it is ultimately unsatisfactory because it is not sufficiently true to its inspiration.

Licenses Looming on the Horizon

It looks like licenses will stay a hot item for at least the next 12 months. Now that the owners of these properties have scaled down their financial demands a little, publishers are getting more enthusiastic about taking the gamble.

Some of the computer games for the Commodore based on licenses which are scheduled to reach stores soon include: *MicroLeague WWF Wrestling* (MLSA), *Howard the Duck* (Activision), *Star Trek: The Promethean Prophecy* (Simon & Schuster), *Ogre* (Origin), and *Auto Duel* (Origin). Further down the road are titles based on "The Untouchables," "Roller Derby," "The Prisoner," and other properties.

Licenses are back. Let's hope the software industry has matured enough to use them as a springboard to excellence rather than as a crutch for crippled programs. ☐

LORD OF THE FLIES

CBS Software
Commodore 64
Disk; $39.95

When CBS was still hip-deep in the entertainment software business a couple of years ago, the publisher always tried to put an educational element in most of its titles. Now that the company has restructured to stress learning software, it is trying to make the lessons more palatable by injecting entertainment value.

Lord of the Flies teaches the ins and outs of William Goldman's book. The novel offers an intriguing look at the nature of evil and its presence in us all. The program doesn't try to supplant the



Some bugs mar **Lord of the Flies.**
READER SERVICE NO. 165

book, but instead provides considerable insight into the meaning of this notable work of fiction.

Lord of the Flies offers four distinct modes of play. The first setting, called The Discoverer, is for those who haven't yet read the book. In it, the gamer meets the characters, explores the setting, and encounters the author's main ideas.

This level is like a mini-adventure game. The user takes the role of one of the characters and makes decisions within the framework of the original story line. It is a painless way to learn this story of a group of children marooned on an out-of-the-way island.

The second level is The Explorer, for those who are more familiar with the story. This setting is ideal for those who read the book some time ago, or who haven't finished it yet. The program poses questions about the characters and the way in which they interact.

The next skill plateau is The Master, designed to students who have completed the novel and are prepared for the toughest questions. Not only are facts and ideas of the characters and the author explored, but many queries examine the applicability of the book's concepts to the reader's own life.

The Book Scanner is probably the most troublesome level. Like Cliff Notes, it spews disclaimers that there is no substitute for reading the *Lord of the Flies,* while doing everything possible to make the actual book superfluous. The Scanner reviews the characters and themes and helps successfully answer questions from the other levels.

The user reads short passages about the island, the boys, and the challenges they face and then responds to questions covering the ideas presented in the passage. These usually are multiple choice, and the course of the plot depends to some degree upon these decisions.

Lord of the Flies contains some elements of adventure gaming. For example, the computerist chooses which boys to befriend, decides which sections of the island to explore, and makes many of the day-to-day lifestyle choices faced by the book's characters. However, it lacks many of the standard ingredients of a regular entertainment program. For example, although there are pictures scattered throughout the program, they don't have the sophistication and finesse of art seen in typical illustrated adventures. The drawings are merely small trimming designed to help hold the gamer's attention. In every instance, getting the student to actually read and understand the text is the focus.

There are several reasons to applaud this effort. Getting all age groups to be better and hungrier readers is a worthy goal. Many people develop good reading habits in high school and college, only to let those same skills deteriorate as career and adult life make larger demands for time and attention.

Lord of the Flies proves a good choice to kick off this series. Goldman's tale contains many of the best elements found in classics by such authors as George Orwell, Stephen Crane, and Mark Twain.

However, there are some complaints with this program. One is that it may be aimed at too young an audience. It is quite likely that junior high and high school students already have plenty of motivating reasons, like grades, to read. It is doubtful this program will do much to supplement the in-class teaching and discussions.

The program could have been aimed at a more adult audience. More thought and care could have been given to The Discoverer section. Really, the entire two-disk program could have been a giant adventure taking place on a remote tropical island. This would allow the user to learn much about the book and its characters. Once the computerist went through the adventure his way, picking up the book to see how the adventure was handled there would be a logical step. It's also a shame that the illustrations aren't up to the level computerists now expect from onscreen entertainment. More ornate graphics would enhance the learning experience a great deal, without distracting from the beauty of the text.

Lord of the Flies remains a classic of modern literature. However, the program based on it tries to do too many things at once.

CBS Software, One Fawcett Place, Greenwich, CT 06836 (phone: 203-622-2500). *—Rick Teverbaugh*

FINAL FOUR COLLEGE BASKETBALL
BASKETBALL: THE PRO GAME
Lance Haffner Games
Commodore 64
Disk; $39.99 each

Lance Haffner's line of homemade sports simulations is clearly not for the casual computer gamer. Sports purists, on the other hand, will find these text-only statistical replay contests far and away the best games of their type. This is particularly the case with basketball, where no alternative stat-based simulations are available on computer. This makes *Final Four College Basketball* and

Basketball: The Pro Game stand as truly remarkable achievements.

Haffner is a fascinating individual. An inveterate creator and player of non-electronic statistically based games since the age of 13 and a computer programmer by vocation, Haffner began fashioning his own sports software several years ago. When his friends reacted positively to the results, he decided to market them. Translations have been slow in coming—Haffner insists on learning the nuances of each computer system so he can do all the programming himself—but now sports-crazy C-64 users can experience these extremely realistic simulations, complete with Lance's own commentary and Christian proselytizing written right into the documentation.

Both these basketball contests use the same basic system: Coaches select from hundreds of available teams and opt to play head-to-head or v. the computer. The athletes can be evaluated through ratings in the following areas: field goal percentage, free throw shooting, rebounding, passing, defense, contribution (how well that player shot and rebounded vis-à-vis the rest of his team), and condition (fit, tired, or exhausted).

The main display features a window at the top of the screen which lists team names, score, clock, half (or O.T.), shot clock (if used), team fouls, rebounds, and turnovers. Beneath that is a window describing actual play (player with the ball, his shot percentage, type of defense, and the offensive style) and a menu of options (shoot, time out, intentional foul, pass, 3-point shot). At the bottom of the screen the full offensive team lineups are posted.

There are, of course, subtle differences between the two games which reflect the divergence in the rules employed in pro and college ball. *Basketball: The Pro Game* features a 24-second shot clock, while *Final Four* offers the option of either a 45-second clock or none at all (Haffner cautions against employing a shot clock with college teams who did not play with one). Both games feature regular, sagging, trapping, tight, and loose man-to-man defensive coverage, but only *Final Four* allows the zone, which is illegal in the pros. *Final Four* also adds a match-up zone defense, which essentially kills time by slowing down the game, allowing easy baskets but fewer fouls and steals—something you would never see in the pros, but a tactic which college teams with big leads employ routinely.

When the game is over, both programs provide complete stats as well as a stat compiler, which allows the user to track play through an entire season. Haffner also includes what he calls a "lookie" program, which provides easy access to the compiler.

Basketball: The Pro Game comes with an incredible 127 NBA teams, from 1955 to the present, including all squads from the last two NBA seasons. *Final Four* includes an even-more-astounding 361 teams, dating back to the 1956 San Francisco team of Bill Russell. Most of the great college squads from the past three decades are represented, including Lew Alcindor's UCLA team and the 1980 Iowa team. Schools which made the NCAA "Final Four" are virtually all present.

To underscore the opening comment, these games are not for roundball dilettantes. The serious hoopster will discover years of enjoyment in these well-crafted programs.

Lance Haffner, P.O. Box 100594, Nashville, TN 37210 (phone: 615-242-2617). *—Bill Kunkel*

SHANGHAI
Activision
Commodore 64
Disk; $34.95

East meets West when the Mystery of the Orient weds sleek technological wizardry in *Shanghai*. Utilizing elements of the ancient game of Mah Jongg, this exciting computer solitaire is an all-age habit-former that can keep the electrons surging 'til dawn.

Few diversions boast this level of player-involvement. *Shanghai* is so compelling that gamers are drawn back to face the challenge over and over.

Designed by Brodie Lockard, *Shanghai* uses 144 tiles, divided into suits. Tiles bear, in addition to their identifying numbers, charming drawings of balls, bamboo twigs, horses, chickens, flowers, and other clever contrivances. Each suit is distinct and ornamental, making the game pieces pleasant to use.

The program randomly shuffles the tiles prior to the commencement of a round. These are arranged in a multileveled pyramid called a Dragon.

Gamers remove tiles in pairs. The computerist positions the onscreen cursor on top of a tile and clicks the action button. When the player locates its twin, a push of the button highlights it as well. An additional tap removes the pair from the field.

Only a tile at the edge of the pyramid, or one atop a pile that is higher than one which flanks it to the left or right, can be removed. When the gamer highlights a tile that is unavailable, an onscreen message advises

that it isn't free. The challenger must either find another match to complete the pair or choose a new starting tile. *Shanghai* continues until all matches are completed, and all tiles are removed from the field, or until there are no other possible moves.

Shanghai is a great deal like solitaire in flavor, if not style. There are two pairs in each suit, so the gamer can never be sure of making the most advantageous pairing. If three matching tiles are visible, the decision can dramatically alter the ensuing course of the contest. Choose the wrong ones, and there's a chance the fourth tile will be locked into an inaccessible position. When tiles are removed, the ones underneath come in view, so the situation stays fresh right down to the last pairing.

Strategy is everything in *Shanghai.* Good memory helps, and luck is certainly a factor since it's possible for a Dragon to contain tiles buried in unsolvable arrangements. (Matching tiles stacked on top of one another are irretrievable, for example.) In most instances, however, good strategic planning is the most necessary ingredient for successful play. Just as a chessist tries to plan many moves ahead, the *Shanghai* master must look as far ahead as possible. The crux of the game is to remove pairs of tiles in a way which opens the possibility of subsequent matchups.

Random shuffling insures that no two Dragons are the same. Onscreen, the contest presents a handsome appearance. The red and white tiles are layered against a deep red background. The visible edges of buried tiles make it easy to see how many pieces are hidden in any stack. If the gamer succeeds in clearing the board, an animated fire-breathing dragon rewards the effort. The only thing missing is music. The program could use a few bells and whistles, a little Oriental loading music, and melodic tones to mark the removal of each pair of tiles. Countdown tones in timed games are the only sound effects. Otherwise, the entertainment is played in silence.

Across the bottom of the screen,



Shanghai *supplies 144 game tiles.*
READER SERVICE NO. 166

a clutch of menu options offers the gamer a chance to take back bad moves, peek at buried tiles, or restart the game. A help feature shows stumped strategians available moves. Although the solitaire mode is extremely satisfying for play, other gaming options available include head-to-head, timed, and tournament settings. There's even a handful of special Dragons with pyramids that include a number of complex strategical problems.

Brodie Lockhart has created a masterpiece of gaming here. *Shanghai* is an instant classic, that rarest of all computer games—one with instantaneous accessibility and enduring challenge. This is one you won't want to miss!

Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

—Joyce Worley

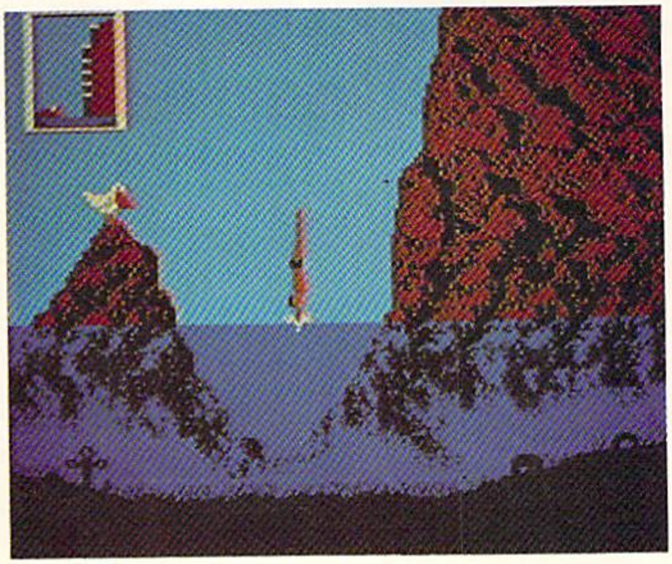
WORLD GAMES
Epyx
Commodore 64
Disk; $39.95

World Games is the latest entry to one of the most popular series in the history of computer entertainment: Epyx's multievent "Games" programs. Like *Summer Games, Summer Games II,* and *Winter Games* before it, *World Games* offers a wide variety of international sports competitions, each event recreated to look, sound, and play as much like the real thing as possible.

World Games allows players to select the country they wish to represent, but eschews the now-familiar opening ceremonies. Instead, there is an optional "travelogue" feature which quickly sets the scene and offers users a description of the upcoming contest.

The first event is weight lifting, which is set in Russia to the accompaniment of an appropriately dour musical theme. The player picks the weight and then attempts to hoist it up with a snatch (one movement) or clean-and-jerk (two movements). Fortunately, players needn't worry about strapping on a lifter's belt; it's all done with a few well-timed flicks of the joystick. The barbell must be held aloft until all three judges flash their lights. A nice touch is that if the competitor keeps those weights up there too long, his face turns redder and redder, then goes all the way to blue just before he lets the barbell

World Games *lives up to the standards set by previous installments in Epyx's series, with impressive audio effects, animation, music, and graphics. READER SERVICE NO. 167*



clang to the floor.

The caravan next moves to Germany, where ice skating daredevils can barrel jump to the strains of "Ach Du Lieber, Augustine." The player sets the number of barrels, then pumps the joystick left and right to allow the onscreen skater to build up a head of steam. Pressing the joystick button makes the skater leap into the air, but further manipulation is necessary on the landing to keep the little guy from crashing through the ice.

Cliff diving in Acapulco is the third event. The display here includes a side view of the diver and a tiny window in the upper left corner of the screen showing the height from which the dive is taking place. As the music builds dramatic tension, the player must guide his surrogate through the air, into the water and then pull him sharply to the surface, as the waters here are notoriously rocky, and fearsomely shallow.

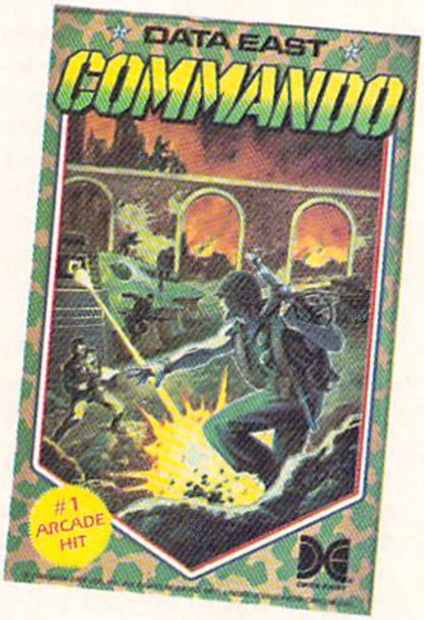
Chamonix, France, is the site of the slalom skiing event. Light and airy music accompanies the skier as he zips around and between the poles dotting the mountainside on the way down, while a clock in the upper right corner ticks off the seconds.

The program then moves to Canada, the Great White North, for log rolling. Two lumberjacks contest to remain upright on a floating log while the local residents watch with rapt attention from the shore. The music for this event is much more reminiscent of Davy Crockett v. Big Jim Fink than anything remotely Canadian, but the competition itself is a real hoot—not to mention extremely challenging.

It's back to the United States for bull riding, another tough event in which players use the joystick to control the movements of a gutsy cowboy astride a singularly unfriendly, sharply horned bull. Ride one successfully, however, and there's another, even surlier bull just waiting to go.

The caber toss is an ancient Scottish competition which calls on well-muscled contestants to hurl a large tree trunk as far as possible. The bagpipes play in the background as the player controls the somewhat "lumbering" movements of the onscreen surrogate, who must build up some momentum before attempting to hurl the telephone pole-like caber.

The final event is Japanese Sumo wrestling. Here the player controls the movements of a mammoth Japanese grappler as he struggles against a similarly outsized opponent within a small, circular ring (as opposed to the "squared circle" used in American boxing and wrestling). The music heard during this event is particularly beautiful, a two-part composition featuring a delicate stringed instrument and a haunting recorder.



Commando: *kill or be killed. Period.*
READER SERVICE NO. 168

World Games easily lives up to the standards set by the previous entries in this series. Each event is skillfully rendered with individualized and invariably impressive graphics, animation, audio effects, and musical accompaniment. From the major animations to the tiniest detail—like the jig danced by the Scots caber thrower after a successful throw, or the shark fin which circles the loser in the log rolling competition—*World Games* is world class entertainment.

Epyx, P.O. Box 8020, Redwood City, CA 94063 (phone: 415-366-0606). *—Bill Kunkel*

COMMANDO
Data East USA Inc.
Commodore 64
Disk; $34.95

You almost feel the excitement from the theater chair as Chuck Norris, Sylvester Stallone, or Arnold Schwarzenegger embark on a perilous rescue mission. There is a sense of expectancy. The battle will soon rage, and bodies will be strewn about the screen like so much driftwood on the beach.

Just as surely as there are people who want to bring the film mayhem home on video cassette, there are gamers who desire to transport this brand of action from the arcade to the home computer. Data East now makes that possible with the home version of the popular arcade challenge *Commando.*

If non-stop shoot-em-ups are your trip, this is the ticket. From the insistent, immediate churning of the theme music that blares as the program loads, this isn't a game for the casual player.

Does the dog want a little pat on the head? Tell him to play with the cat! There is no time to look away from the screen. There is no opportunity to take your hand away from the joystick even long enough to mop your sweaty brow.

Only two things are important: kill or be killed. That's really all there is to the game. To give an idea of the depth of the challenge, all the manual's instructions are printed on one page.

The joystick controls the onscreen movement, the fire button shoots the gun, and the space bar hurls grenades. That system causes big problems. First of all, you can only toss grenades a set distance straight ahead. That means the computerist needs to wait until the enemy is precisely positioned before pulling his pin. It is helpful that the projectiles has such a broad range of effectiveness, but there's no way to get the other onscreen foes to hold still long enough to get a particularly bothersome opponent with a grenade.

That's the game's biggest drawback.

There is no time for strategy. Sure, there are trees and rocks to hide behind to gain a short break from the enemy, but since they are coming from both sides of the screen as well as the top, very little rest is offered.

One line in the manual is good for a laugh. It reads, "Dodge all bullets and grenades." Who can go wrong with a strategy hint like that! The person who can do that will not only have a record-breaking score, but should also be considered a leading candidate to replace Herschel Walker in the Dallas Cowboys' backfield.

To the game's credit, it isn't bloody, and it doesn't wallow in the death and destruction being caused. There are no sounds of enemies groaning in agony as they expire.

The manual says that one or two joysticks can be used, but there is no mention of what the second stick does. There seems to be no effect produced by it.

The method for entering high scores is unique, and quite appropriate for the ambience of the program. When the music slows down, the gamer must line up the proper letters in the gunsights and shoot them. However, after all the button-pushing, stick-pounding trouble it takes to compile and record a score, it is all wiped away once the computer is turned off. The top ten scores aren't saved to disk. That makes it very difficult to gauge progress from one sitting to the next.

Points are scored by killing off the enemy. Bonus points come from rescuing prisoners, knocking off the enemy's leaders, and destroying their headquarters.

The game has enough challenge to keep even the quickest reflexes busy for some time, but it's too bad there couldn't have been more of a test of wits through into the bargain.

Data East USA, Inc., 470 Needles Drive, San Jose, CA 99512 (phone: 408-286-7074). *—Rick Teverbaugh*

Reviewed Next Month:

- **Championship Wrestling**
- **Warship**
- **The Movie Monster Game**


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AMIGA SECTION

RAM EXPANSION FOR THE AMIGA 1000

By Morton Kevelson

A little more than a year since its introduction, the Amiga 1000 has made amazing progress. The third party software support for this system has been truly outstanding for a new machine. A large part of this enthusiasm is due to the potential of the machine itself. Of equal importance has been the high level of technical support provided by Commodore since the introduction of the Amiga. This has consisted of extensive documentation of both the hardware and the operating system software for the machine. Of even greater importance was the concurrent release of high level development tools for the system.

From the outset, the Amiga's programming environment provided nearly everything which was required. For the end user there was ABasic which was very quickly replaced by Microsoft's Amiga Basic. The latter has been justifiably called the most powerful BASIC available for any microcomputer to date. For the developer, Commodore provided the programming tools with which they were most familiar. In particular, all the facilities needed for working with the popular C language were available from day one.

The presence of sophisticated new hardware and the corresponding software tools is to developers as honey is to bears. The development of software actually began well before the release of the machine. Of course many of the earlier releases were simply hasty conversions of existing software from other less endowed systems. These were initially disappointing, as they failed to make use of many of the Amiga's unique features. Fortunately, these straight conversions were the exception rather than the rule. Furthermore, many of these early releases were followed by upgrades which did take proper advantage of the system. As a result, today's user has his choice of high quality software for virtually any application traditionally applied to a microcomputer: far more, in fact, than can be comfortably squeezed into a half megabyte of RAM.

Notice that we referred to the Amiga's half megabyte of RAM and not just the quarter megabyte supplied with the basic system. Although the Amiga will function with just a quarter megabyte, we have found this to be insufficient for many applications. Multitasking in particular will be severely curtailed by a lack of RAM. As a result, the first accessory for a new Amiga user is the built-in RAM expander. Commodore has effectively acknowledged this system's need by including the 256K RAM expander in their latest promotional offering for the computer.

The need for memory has become fundamental to microcomputing. We have noted in the past that we can never seem to get enough of the stuff. The availability of microcomputer RAM has grown exponentially while its cost has dropped by an inverse amount. In less than a decade, microcomputers have gone from 8 bit machines with barely 4K of RAM to 16 and 32 bit engines whose memory is measured in megabytes. The progress of the programmers and the end users has been even more dramatic. Both have managed to fill every byte of this new technology with programs and data.

Deluxe Paint by Electronic Arts is an excellent example of this phenomenon as applied to the Amiga. The entire program, with two lo-res work screens, will not fit into 256K. A half megabyte is required for best results. The hi-res version of *Deluxe Paint* will not run at all in less than a half megabyte, and will still be limited to a single work screen with program overlays for specialized tasks.

Of even greater concern are the memory requirements for multitasking. The memory needs of multiple applications can be enormous. In fact, lack of memory is probably the greatest factor in limiting the Amiga's multitasking capabilities.

The traditional solution for additional storage has been external capacity on floppy disks. However, even

RAM EXPANSION ON THE AMIGA 1000

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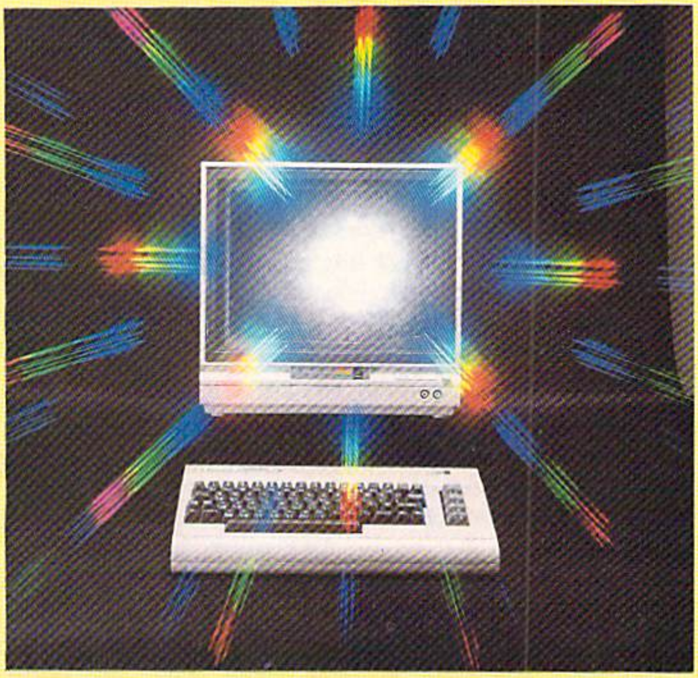
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this is rapidly becoming inadequate. In the past, floppy disk capacity has substantially exceeded the internal capacity of a system's RAM. The Amiga squeezes 880 kilobytes onto a 3.5 inch disk. Although this is a respectable amount (more than three times the capacity of the unexpanded system), it is substantially less than twice the amount of RAM found in most systems.

AmigaDOS is disk-intensive. All its commands have to be loaded from disk prior to execution. Amiga users have also become spoiled by the snappy responses normally provided by the computer. They expect instant gratification. Thus, even the brief and all-too-frequent delays caused by the high speed floppy disk access are annoying. Nearly intolerable are the endless disk swaps which must be endured on single drive systems. As a result we have found that the second disk drive has become the most popular accessory after the 256K RAM expander. Amiga users have also become very adept at using the DOS RAM: device for frequently accessed commands. Of course this also uses up precious RAM.

After using the Amiga for several months, we have become convinced that the optimum solution is additional RAM. This was not overlooked by the Amiga's designers. The 68000 microprocessor can directly address 16 megabytes, of which up to 8½ megabytes has been reserved for RAM.

CHIP V. EXTERNAL RAM

The Amiga's built-in RAM and that on the 256K expander is known as chip RAM to Amiga programmers. This serves to emphasize the important difference between the internal half megabyte and the external eight megabytes. The chip RAM is the only RAM which may be directly accessed by the Amiga's custom graphics and sound chips. This is very important for multitasking with the Amiga's icon-driven operating interface. In order to retain the maximum possible speed of the operating system, all graphic data for windows and screens must reside in chip RAM. This data can be substantial.

A high resolution, non-interlaced window (640 by 200 pixels) requires 16,000 bytes for each bit plane. However, a single bit plane permits only two colors. The *Workbench* screen, with four colors, utilizes two bit planes for a total of 32,000 bytes. A high resolution interlaced screen (640 by 400 pixels), with its maximum of 16 colors, will require four bit planes of 32,000 bytes each: a total of 128,000 bytes! Each open window on the *Workbench* will need some memory of its own. Overlapping windows on the *Workbench* will consume additional memory even if they are not directly visible. The data which instantly appears as a window is uncovered and has to be stored somewhere. All of this graphic data must be in chip RAM if the speed of the Blitter is to be used to its full advantage.

External RAM is the domain of the 68000 microprocessor. Data stored therein may be manipulated only by the Amiga's 68000. Properly written Amiga programs will keep this in mind by arranging for the executable code and the associated data to be stored in external RAM, leaving the maximum possible chip RAM free for graphics and sound. The Amiga's operating system includes routines which are dedicated to the allocation of memory resources. Chip RAM lies in the microprocessor address range of $000000 to $03FFFF while external RAM is designated at $2000000 to $9FFFFF.

When adding memory to the Amiga, we strongly recommend the addition of the built-in 256K RAM expansion before any external RAM is considered.

The System Clock

We have received some inquiries regarding the peculiar 7.15909 MHz clock frequency at which the Amiga's 68000 microprocessor operates. All of the Amiga's timing signals are generated by a very precise 28.63636 MHz crystal oscillator. This is divided in steps by factors of two. The resulting 14.31818 MHz signal is used for the timing of much of the Amiga's logic circuitry. The next division yields the 68000's clock frequency. One final division results in 3.57954 MHz, which happens to be the exact frequency of the NTSC video signal's color clock on which this entire chain of events is based. Just why the NTSC picked this particular clock frequency is another story entirely.

ZORRO SPECIFICATION

Unlike the most popular microcomputers in the "business" market, the Amiga lacks the facilities for internal expansion. Instead, the Amiga is equipped with a single 86 pin edge card connector for external expansion. This is a full system bus with all the connections required for any conceivable peripherals. This slot is in addition to the serial, parallel, video, audio, and floppy disk drive connectors located on the back of the machine.

It becomes apparent that the lack of internal expansion is not a significant restriction when we consider that one or more of the "business" machine's slots are usually occupied by cards to allow for serial, parallel, and video, as well as RAM expansion. All of these functions are already provided for on the Amiga's external connectors.

Nevertheless, Commodore has recognized that some Amiga users may wish to expand their machines beyond the capabilities of the "business" machines. In the interest of hardware harmony and to provide for the orderly development of and compatibility among Amiga peripherals, Commodore has published a detailed hardware specification. This specification covers all the external characteristics, both hardware and software, of the interface cards. It also spells out the internal arrangement of the Amiga 1000, and the type and timing of the signals on the expansion bus.

The contents of the specification

are important to software developers as well as hardware designers. An understanding of the Amiga's hardware configuration is required in order to write programs which make proper use of the expansion bus peripherals. In particular, the proper recognition of external RAM should be a basic requirement of all Amiga packages.

The Amiga hardware specification has been adopted as a standard by numerous hardware developers. The phrase "Zorro compatible" has frequently appeared in the Amiga literature. Actually, the Zorro monicker originally referred to the Amiga itself during its developmental stages. In fact the schematic of the Amiga's main circuit board, which is included with the expansion specification, still bears the Zorro name.

The adoption of the Zorro specification as a standard is not without some risk. The specification was first distributed to developers in late 1985. At that time the expansion racks were to have 86 pin connectors, the same number of pins as on the Amiga's connector. Since then this has been changed to 100 pin connectors for the expansion racks. Note that the Amiga will still retain the original 86 pin design. We expect this statement to generate a collective sigh of relief from many Amiga users concerned with the imminent obsolescence of their machine.

The risky part of the specification is that Commodore has been very careful to mark all of it as preliminary. In fact some of the drawings in the current version dated June 9, 1986 are marked "SERIOUSLY PRELIMINARY!" Nevertheless, many developers have chosen to forge ahead. The size of the Amiga market, based on the present specification, is apparently worthwhile. We have also found that standards have a way of establishing themselves based on actual numbers of users. If enough users and manufacturers adopt a particular specification, it is in the best interests of everyone concerned to maintain upward compatibility in new products.

Some specific requirements of the Zorro specification are worth noting. All expansion cards have 100 pins, 14 more than the Amiga's expansion connector. Some of the extra pins are for the expansion box's built-in power supply. The specification calls for +5 volts, +12 volts, and −5 volts to be available in the expansion box. Current requirements are 2.5 amps of +5 volts for each slot plus an additional margin of 1.5 amps. Thus a two slot chassis should have a +5 volt supply with a 6.5 amp capability. The +12 volt supply should be able to deliver 1 amp and the −5 volt supply should be rated at ½ amp.

The inclusion of a built-in power supply is essential. The Amiga's power supply can only support approximately one megabyte of external RAM with today's technology.

The remaining additional pins are reserved for intercard communications. Each card must also contain identification data. This includes a manufacturer code, the card type and serial number, and the amount of RAM if applicable. When the Amiga

Expansion Card Installation Tips

Whatever means you choose to expand your Amiga, observe the following precautions. Insert the expansion device all the way into the 86 pin connector. Both the Amiga and the expansion device should rest on a flat surface to completely eliminate relative motion between the two devices. Any motion can cause a hardware glitch which will crash the system. If the external device is self-powered, always turn it on first.

Note that version 1.1 of the Amiga's operating system will not recognize autoconfiguring memory boards. On the other hand, version 1.2 (currently in a final test release) does. As a result, memory boards are supplied with a special program which allows version 1.1 to recognize the added RAM. You should make sure that the board is designed to autoconfigure under 1.2.

A Glossary of Technical Terms

Capacitance–The electrical property of the physical proximity of two conducting surfaces. These may be traces on a printed circuit board or simply adjacent wires. Any potential difference between the two surfaces causes energy to be stored in an electrical charge between them. The charge is equal to the product of the voltage and the amount of capacitance. The rate at which the charge can be added to or removed from a capacitor is determined by the driving voltage and the resistance of the circuit. This results in a delay of the propagation of timing signals by inhibiting the change of voltage which limits the speed of operation of our computers. The larger the circuit, the greater the capacitance and the longer the delays.

Inductance–The electrical property of any conducting path. A current flowing through a circuit causes energy to be stored in an associated magnetic field. This tends to delay the propagation of signals by inhibiting changes in the flow of electrical current. The longer the circuit, the greater the inductance.

Resistance–The electrical property of materials which inhibits the flow of current. This prevents the instantaneous change of charge stored in capacitance or the magnetic field stored in inductance.

MHz–An abbreviation combining mega and hertz. The former signifies one million and the latter represents one vibration per second. The unit hertz is named after Heinrich R. Hertz, the 18th century German physicist who contributed significantly to our knowledge of things involving magnetism. Prior to the adoption of the term hertz, the unit of vibration was cycles per second, abbreviated cps.

powers up it interrogates the cards in sequence. Actually, each card must contain the intelligence to pass on the interrogation request to the next one down the line.

All of the required 68000 microprocessor's signals are present on the 86 pin connector. These are direct connections to the 68000, without any buffering. Thus the expansion box should provide the necessary signal buffers.

There are two aspects to the expansion box design: backplanes and plug-in cards (PICs). The backplane interfaces to the Amiga's 86 pin connector or to an 86 pin connector on another backplane. Thus the specification allows for the chaining of expansion boxes. The backplane must provide the necessary buffering of the bus as well as the 100 pin connectors for the PICs.

The PICs are the actual cards, such as expansion RAM, which are used by the Amiga. The Amiga operating system software only recognizes the existence of PICs and knows nothing about the backplanes.

External RAM expansion must come in discrete blocks. The smallest RAM block is 64 kilobytes. Other sizes may be any multiple of two times 64 kilobytes up to a maximum of 8 megabytes. This allows for eight different size memory expansion blocks. Memory blocks must lie on address boundaries which match their space requirements. The exceptions are the 4 and 8 megabyte boards. The first must also map at $200000 and $600000 ($400000 and $800000 are the "natural" 4M boundaries). The second must map into $200000 ($800000 is the "natural" 8M boundary). The exception for the large memory boards is to insure compatibility with future models of the Amiga.

RACK IN V. SLAP ON

Memory expansion is currently offered in two physical forms. The slap on styles are single, self-contained cartridge packs which attach directly to the Amiga's 86 pin expansion port. These should actually be configured as a self-contained PIC with a built-in backplane. As such they should follow all the applicable rules of the Zorro specification. They generally draw their power from the computer, which limits their size and the number which can be connected at one time.

If the slap on card is equipped with a pass through connector, then it should permit the addition of a full expansion board at a later date. A slap on card cannot be inserted into a Zorro-compatible box, as it should actually be the equivalent of a single slot Zorro RAM box.

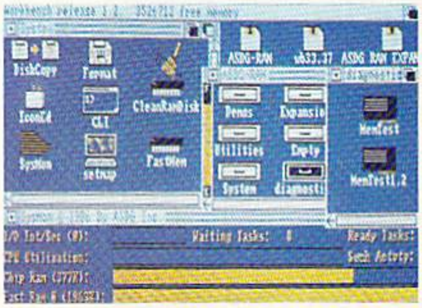
The rack in system is of course the full Zorro expansion box. These are currently available with two or more slots and may also include a pass through connector for additional boxes. Although the Zorro specifications allow for multiple boxes with numerous cards, physical characteristics will limit the maximum expansion. The specification even expresses concern over the feasibility of chaining two Zorro boxes or slap on cards.

The Amiga system is state of the art, with the 68000 running at 7.15909 MHz. At this speed the capacitance and inductance of the board connections and printed circuit traces start to play an important part in the speed of the switching operations. In fact, timing considerations make it impossible to chain more than two Zorro boxes with zero wait states.

Slap on boards are generally less expensive than a full system. They also take up far less space than an expansion box. Their prime disadvantage is the limitation to future expansion of your system. Also, the slap on boards may lack essential features which would allow them to be used with a future add-on box. If you do decide to buy a slap on board, get as much memory as you can afford. If you must buy a smaller amount of memory, look for one which allows for the addition of RAM on the board itself. Some of these boards may be designed to work with 256 kilobit chips, which can be replaced by one megabit chips when the latter become readily available at lower prices.

ASDG BUS EXPANSION SYSTEM

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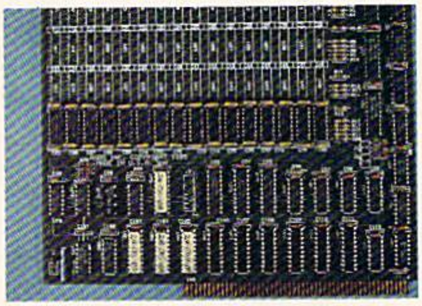


Workbench *display with ASDG utility icons. Note grand total of free memory.* SysMon *display at bottom is ASDG system performance monitor. Note separate displays for chip RAM and RAM board.*

We were recently visited by Perry Kivolowitz, a proprietor of ASDG (Advanced Systems Design Group). Perry used this opportunity to show off the ASDG Bus Expansion System with four megabytes of expansion RAM for the Amiga. In return we used this opportunity to pick Perry's brain as an independent developer for the Amiga. The following report on the ASDG hardware is based on six hours of working with the system and is not intended as a full review. However, based on this experience we have confidence that the hardware will be all that it claims to be.

The Mini-Racks

All of the ASDG expansion boards are of the rack in variety. As such they cannot be plugged directly into the Amiga's 86 pin expansion connector. Some form of expansion chassis



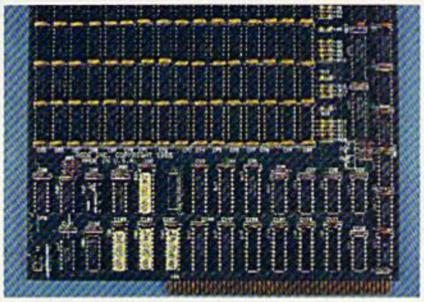
Left: 1/2M RAM board without sockets. Cluster of white labeled chips at bottom are the PALs. Clockwise from top: COL (collision detection), ROM (identifica-

is required to accommodate the 100 pin edge connectors. To provide a minimum cost path to full Zorro compatibility, ASDG offers two versions of a two-slot Amiga backplane.

The Mini-Rack-C supersedes ASDG's internally identical B version. The only changes between the two products are in the design and appearance of the metal case. This chassis provides a substantial subset of the Zorro requirements with two exceptions: The power supply lacks the +12 volt and −5 volt supplies, and one of the Zorro timing signals is not synthesized by backplane. The Mini-Rack B is intended for use with the ASDG memory boards which require only the +5 volt supply. The ASDG boards also synthesize the missing timing signal. The Mini-Rack-B's 6 amp, +5 volt supply is ½ amp shy of the Zorro specification's requirement for a two-slot board. This is not significant, as the extra 1.5 amps in the specification was intended as additional margin beyond what was anticipated.

The Mini-Rack-C is intended for the user who is looking for a minimum cost option in which to utilize the ASDG memory expansion boards. As such, the chassis' price reflects only the actual manufacturing costs. To emphasize this point ASDG offers a 100% open ended credit on the exchange of the Mini-Rack-C and the Mini-Rack-D towards any upgrade chassis they will ever offer.

The Mini-Rack-D provides 100% Zorro compliance with the Zorro specification. The timing signal and



tion), CFG (configuration), RFS (dynamic refresh). At lower left is autoconfiguration jumper. Right: same board fully populated with 256K RAM chips.

the +12 volt and −5 volt supply voltages, which were left out of the model C, have been included. In all other respects the board is identical. Physically, both mini-racks present 6" wide by 10" deep footprint alongside the Amiga. The height is a rather imposing ten inches. These dimensions are dictated by the size requirements of Zorro compliant boards. When installed alongside the Amiga, both mouse ports are left in the clear. The chassis does extend a few inches behind the Amiga's back panel.

Both versions of the Mini-Rack must be either the last or only chassis in the Amiga's expansion slot, as they lack a pass through connector. The back panel of the Mini-Rack has cutouts for four 25 pin "D" connectors and one IEEE-488 connector. These are for use with I/O expansion boards.

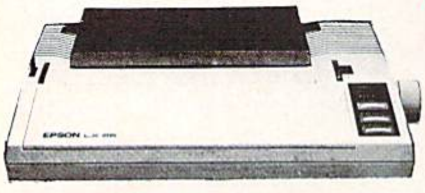
The RAM Boards

At this time ASDG is offering a board design which may carry one half, one, or two megabytes of RAM. The 256 kilobit, 150 nanosecond (a nanosecond is 1/1000 of a microsecond) dynamic RAM chips are laid out in four rows of 16 each. If you elect to purchase less than the full two megabytes, you may have the board fully socketed for an additional $75. This option also comes with clip-on configuration jumpers. The standard board has its jumpers soldered in place. This would allow the board to be subsequently expanded to its full capacity by simply inserting RAM chips into the empty sockets. The un-

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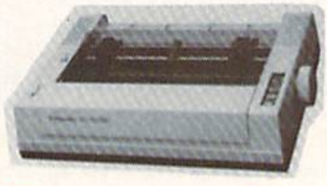
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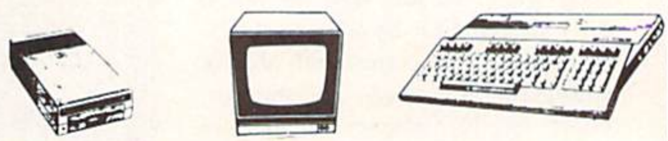
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derlying concept is to buy only the RAM you need while you wait for the inevitable fall in chip prices.

Those of you who are familiar with dynamic RAM requirements may have noticed the absence of the usual large scale RAM refresh chip on the accompanying board photo. Dynamic RAM has the annoying tendency to forget what it has been told if it is not periodically reminded about it. To put it simply, one must constantly refresh the computer's memory. The process is fairly straightforward, but it does require careful timing to avoid conflicts with the rest of the system. These can delay the computer's processing by generating forced wait states.

ASDG has chosen to develop their own custom circuitry for refreshing RAM. The two key chips in this scheme are a delay line, which handles the timing, and a PAL (programmed logic array) chip. The result is that the ASDG RAM boards present no wait states to the Amiga's 68000 microprocessor.

Three additional PALs complete the memory board's Zorro requirements. One of these handles the board's autoconfiguration. This informs the Amiga that the RAM board is ready and waiting for data as well as the amount of RAM, the manufacturer of the board, and so on. Most of this data is contained in another PAL which emulates a miniscule onboard ROM chip. Some of the information is generated by the position of several onboard jumpers.

The remaining PAL performs bus arbitration or collision prevention. This chip acts as a traffic cop directing the order in which multiple boards respond to system requests. The design of the Amiga's expansion system includes an orderly progression whereby the physically closest board responds first. Requests to the outer boards are passed down the line from one to the next.

The ASDG RAM boards adhere to standard design pratices for high speed digital logic circuitry. They are four layer, glass epoxy boards with the +5 volt power plane and the ground plane as the embedded layers. The actual circuit traces in the top and bottom layers are for the most part orthogonally arranged to minimize electrical coupling of the signal paths.

Before continuing to our next topic, we should indicate that the ASDG RAM are 100% Zorro compliant. As such they should work with any Zorro-compatible expansion system.

The System Software

In the ever increasing complexity of the microcomputer world we find that expansion hardware tends to generate a need for supporting software. Amiga RAM expansion boards are no exception. Of course the ASDG memory boards come with their own software. The first group of programs are for use with version 1.1 of the Amiga's operating system. These utilities are required, as version 1.1 does not automatically recognize expansion RAM. Although we expect version 1.2 of the operating system to be officially released well before you read this, you will probably find a need for the 1.1 disks. We expect much of the Amiga software presently being distributed to work properly only with version 1.1 of the operating system.

In addition to the 1.1 installation programs, ASDG provides several other utilities. The most notable utility is ASDG's recoverable RAM disk. This lets you create a RAM disk in external memory as Amiga device VD0: (Virtual Drive Zero). The user specifies the maximum size for VD0: which may be as much as two megabytes. Note that this does not allocate the specified memory to VD0:. Doing so would make this memory unusable for other applications. This merely sets the upper limit which VD0: may dynamically expand into.

When in use, VD0: functions very much like a combination of the Amiga RAM: device and a 3.5 inch floppy disk. The main difference is what happens after a system crash. Data in RAM: will be normally lost. Data in VD0: will still be there after the system reboots! We had ample opportunity to test this feature during our trial run.

When in operation, a VD0: icon will appear on both the version 1.1 and 1.2 *Workbench* screens. The Amiga's RAM: icon only appears with version 1.2 of the operating system. In use VD0: can be treated as any disk drive. You can even examine its contents using *DiskDoctor*, the Amiga's track and sector editor. There are two limitations worth noting. The Diskcopy command does not work with VD0:, or with RAM: for that matter. This is a limitation of the operating system and not VD0:. Under version 1.1, files cannot be copied to VD0: by dragging their icons. However, the CLI copy command will work. Icon dragging works just fine with version 1.2.

In normal use VD0: puts itself in the top of fast RAM. Under some conditions, VD0: may work its way down into chip RAM. If this happens, the VD0: driver will monitor fast RAM for available space so as to move VD0: out of chip RAM as soon as possible. The danger is that the driver may not recover data in chip RAM after a system crash. Note that ASDG has designed their recoverable RAM disk software to require at least one ASDG RAM board to be on the expansion bus in order for it to function.

For those of you who like to peer under the hood of your fancy hardware, ASDG has thoughtfully provided *SysMon*. Although the *SysMon* display bears a passing resemblance to *GfxMem*, a public domain memory usage display, it is an original Perry K. creation which provides far more information. The program puts up a graphic display which continuously shows the allocation of key system resources. In particular *SysMon* displays the 68000's level of utilization as a bar graph, task switching activity as an actual count, disk and keyboard I/O interrupts as both a count and bar graph, and memory usage as a count and bar graph on a per board basis. For the last feature, a system with two external RAM boards would result in three

memory graphs for chip RAM and the two boards. *GfxMem* would place all external RAM in a single display.

The four megabyte, two board setup clearly demonstrated the effectiveness of *SysMon.* Programs consistently loaded into the first RAM card while VD0: occupied the second card.

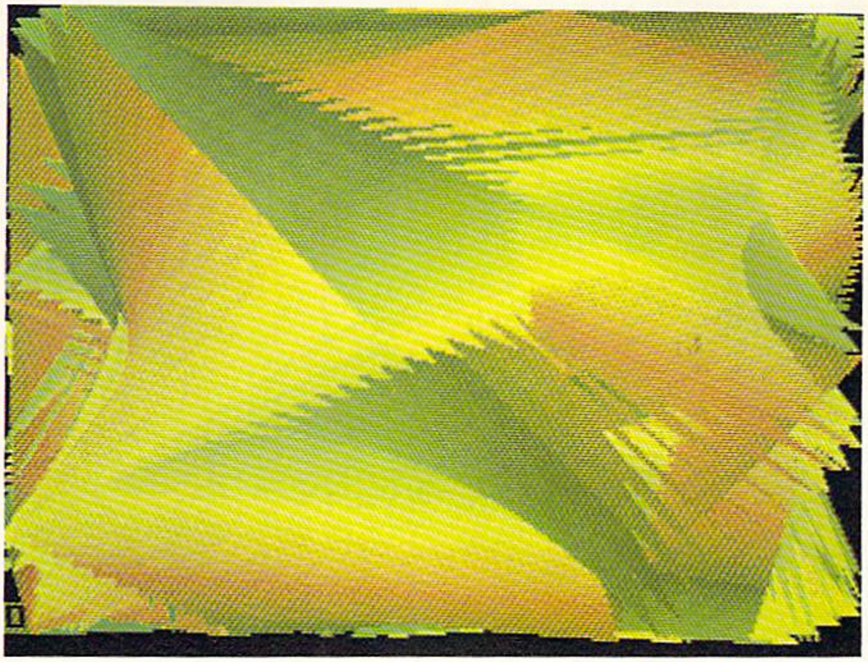
For those recalcitrant programs which refuse to recognize external RAM, the *FastMem* utility acts as a simple toggle to turn RAM on and off. It does this by setting the RAM pointers to indicate all RAM has been utilized. This forces the next program to load into chip RAM.

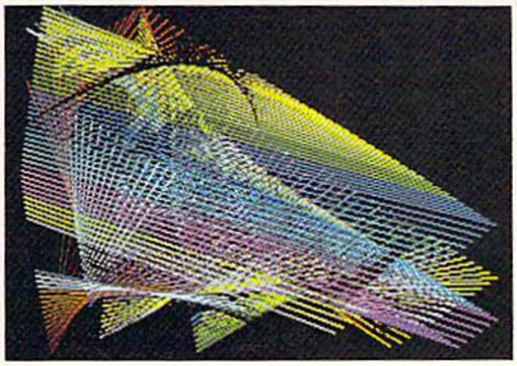
Each ASDG RAM board also includes a plug-in jumper which disables the autoconfig feature. This is intended for use with the RAM diagnostic utility running under version 1.2 of the operating system. It should not be used to disable the RAM board for any other reason. The board has to be removed from the chassis to reach this jumper. It is much simpler to simply run *MemTest* under 1.1 and leave the jumper in place.

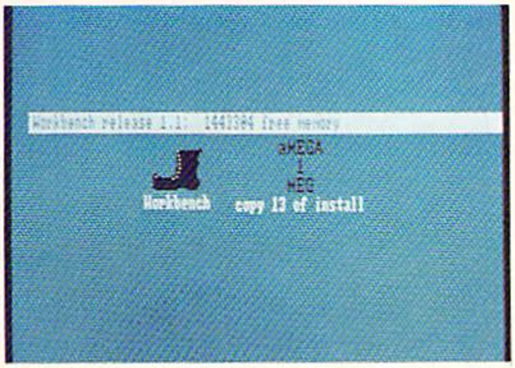
Conclusion

The ASDG RAM expansion system for the Amiga appears to be well-designed. They have managed to assemble a fully expandable Zorro compatible system for little more than the cost of just a RAM board. The recoverable RAM disk software is a must have for every serious developer of Amiga software for whom system crashes are a way of life. Overall, ASDG clearly has the beginnings of a good product line.

—Morton Kevelson







Above and left: a pair of graphic screens from the Modula-2 demos included on the aMEGA Install disk. These single screens form a continuously changing display. See page 64 for more.

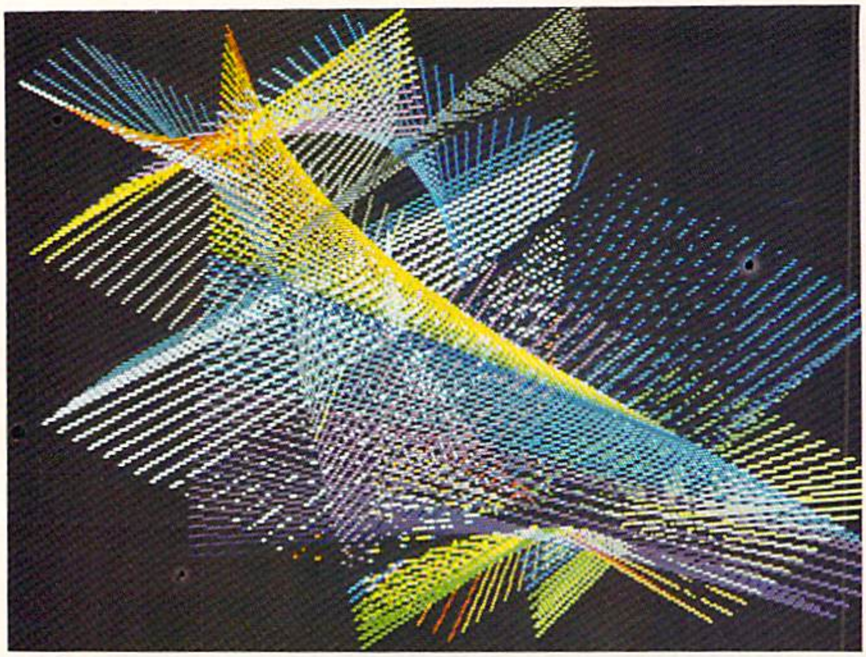
Bottom left: a closeup of an aMEGA-modified* Workbench *icon. This is what the aMEGA install does to your Boot disk. Utilities found on the distribution disk include AutoConfig, Add-Mem, FixHunk, GfxMem, and a shareware screen dump (see text).

aMEGA

C Ltd.
723 East Skinner
Wichita, KS 67211
Phone: 316-267-6321
Price: $549.95

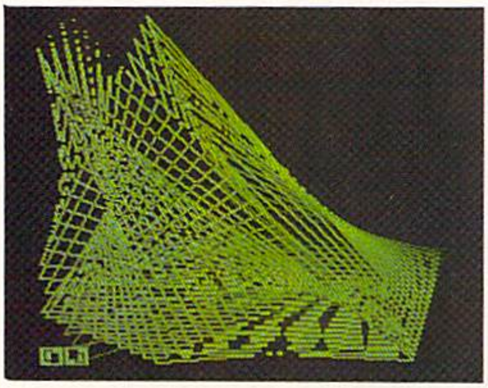
We've heard the story that old microcomputer companies never die. Their personnel just reappear working for companies with different names. There must be some truth to this story. The most striking example of this phenomenon was pulled off by our dear old Uncle Jack. More recently we have the goings on by the people of the late Cardco, Inc., a producer and purveyor of numerous printer interfaces for the C-64 and other related knickknacks. In particular, Ed Lippert, former head honcho at Cardco, has resurfaced in charge of C Ltd. While the printer interfaces have gone elsewhere, Ed has managed to retain the rights to the Amiga expansion RAM (as well as an undisclosed quantity of Cardco shipping cartons) which was nearing completion at the time of Cardco's untimely demise.

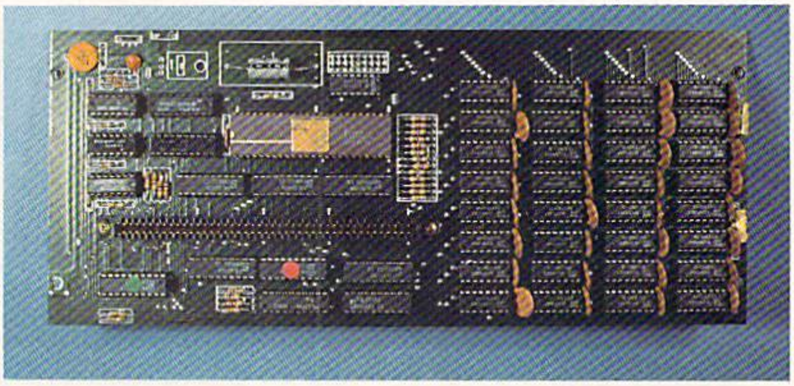
In addition to the Amiga product



Top and bottom left: more graphic screens from Modula-2 demos (see page 63).

Below: the aMEGA board. The 86 pin connector in this view is actually the pass through connector. The connector that mates to the Amiga is on the other side of the board. The custom PALs are marked with a red and green spot. The RAM controller is the largest chip on the board. The 1,048,576 bytes are contained in the 4 × 8 rectangular array of 262,144 bit chips. All chips are socketed for easy replacement.





line, C Ltd. continues to retain first place in our catchy product name contest. aMEGA, their first Amiga product release, is quite obviously a megabyte of RAM in a slap-on package for the Amiga 1000. For those of you who are wondering just how much a million bytes (actually 1,048,576 bytes) is, just try counting them sometime. It should take you about a week and a half if you can stay awake that long. From an Amiga's point of view, a megabyte is nearly 14% more than the capacity of its 3.5 inch floppy disks.

From the user's standpoint, life with an Amiga and aMEGA can be very comfortable indeed. If nothing else, it gives you the option to simply copy the entire contents of the *Workbench* disk into RAM: and still have 600 kilobytes of memory to spare. All you need do is issue several Assign commands, and *AmigaDOS* takes all further instructions from RAM:. The result is the elimination of numerous disk swaps, increased online disk storage for application programs and data, and of course increased execution speed of the *AmigaDOS* commands.

The Hardware

Following the accepted construction practices for high speed digital logic, aMEGA is assembled on a four layer, glass epoxy printed circuit board. The two central layers are the +5 volt and ground planes with the active circuit traces on the outer surfaces. Memory consists of thirty-two 256 kilobit, 150 nanosecond dynamic RAM chips in a 4 by 8 rectangular array. Dynamic RAM refresh is accomplished by a tried and true Intel 8206 RAM controller. A pair of PALs provide the mandatory control and autoconfiguration for the Amiga. The remainder of the circuitry consists of standard, low power logic components.

Although the use of the 8206 RAM controller does introduce some wait states in the computer's operation, the effect is minimal. C Ltd. claims a worst case slowdown of only 4.5%. During actual operation the slowdown would be even less, as wait states may occur only when the microprocessor tries to access the expansion RAM. C Ltd. estimates the average user would miss about 15 seconds out of every hour. We have had this estimate confirmed by a reliable and independent source.

The aMEGA board was clearly designed with ease of serviceability in mind, as all the chips are socketed. With the exception of the PALs, all

chips are standard, off the shelf components. The board is completely enclosed in a three piece metal case which is readily disassembled. The 5" high by 11¼" deep package adds only 1¼ inches to the width of the Amiga. The 86 pin edge card connector is positioned so the package clears the mouse ports. As a result the package extends about 2½ inches beyond the Amiga's back panel. The package rests firmly on the table, without the benefit of intervening padding or feet, and it extends about ¾ inch above the top surface of the Amiga.

aMEGA provides for additional expansion via a second 86 pin expansion bus pass through connector hidden under an easily removed panel. This would let you add additional aMEGA cards or perhaps a full expansion box. Note that the aMEGA card cannot be used inside a Zorro box. C Ltd. claims that up to four aMEGA boards may be daisy chained in this fashion. We feel some cautions are in order.

The power requirement of an aMEGA board is 500 milliamperes at five volts. The Amiga's expansion connector is rated at 1000 milliamperes at this supply voltage. This implies a power limitation of two aMEGA boards. The Zorro specification calls for full buffering on all the logic lines in an expansion chassis. The aMEGA card does buffer all internal data lines. However, the lines which pass through the connector are not buffered. The lack of buffering should not present a problem for peripherals which use standard TTL chips. The Amiga's bus can drive up to five TTL loads without any problems.

Finally, both of the aMEGA's 86 pin connectors are female. To mate a second aMEGA card with the first requires the installation of an 86 pin edge card extension, a $19.95 option. This arrangement requires two additional series electrical contacts for every board added to the daisy chain. Although all of the contacts are gold plated, the arrangement is still subject to mechanical vibration, which may affect reliability.

The Zorro specification also raises some doubts with regard to timing considerations when chaining more than two boards. C Ltd. does indicate that the aMEGA's timing tolerances have been carefully controlled and will match the Zorro specification very closely. This is specifically to permit the maximum possible extension of the bus. In addition, the lack of pass through buffering should actually improve the timing tolerances of the system.

The Software

If you are running version 1.2 of the *AmigaDOS* operating system, then the aMEGA board need only be plugged in. The operating system will automatically recognize the presence of the external RAM. If you are still running version 1.1, some preliminary setup is required. C Ltd. provides two ways to go about this, *AutoConfig* and *AddMem.* Both methods may be automatically installed on as many copies of your *Workbench* disk as required.

AutoConfig is a general purpose utility which will recognize all expansion bus peripherals which need to be recognized. The penalty is slightly greater memory usage than *AddMem. AddMem* is designed to work with only a single aMEGA board. Other expansion bus peripherals will have to provide their own autoboot routines. *AddMem* will crash if it does not find an aMEGA board on the bus.

In addition to *AutoConfig, AddMem,* and their corresponding Install programs, several other utilities and demos are on the distribution disk. For those programs which do not recognize external RAM, the RamOn/Off utility will toggle extra RAM on and off. What it actually does is reset the RAM pointers to prevent the programs from making use of the expansion RAM. This forces the program code into chip RAM. In some cases, the *FixHunk* utility may be able to modify the original program to properly recognize expansion RAM. It should be used only on backups of your original software.

For the curious, the public domain *GfxMem* utility will display a continuously updated bar graph of chip RAM and expansion RAM allocation.

The remaining programs are not directly related to expansion RAM. A handy shareware ScreenDump utility will be a useful asset for printerphiles. The program was written by Ned Konz, who asks for a voluntary contribution of $10 from satisfied users. It is well worth the price. Also included are a set of demos from the Gizmos package, a commercially available utility program. For programmers, a collection of Modula-2 demos are also included. Most of these generate some captivating graphic displays. Among the Modula-2 demos is *ARAMTest*, a comprehensive set of memory test and diagnostic routines.

Conclusions

We are pleased to see that Ed Lippert has been able to continue production of the aMEGA RAM board, and we look forward to future C Ltd. products for the Amiga. The aMEGA board is a well-designed, low cost megabyte expansion RAM for the Amiga, which has provided us with problem-free performance during the past month. Proper supporting software, combined with full autoconfiguration under the version 1.2 operating system, insures maximum compatibility with existing and future software releases.

Although a pass through connector is provided, we recommend that its use be limited to one or two additional aMEGA boards. Conversely, the aMEGA board may be daisy chained to a compatible Amiga expansion chassis. If you do intend to daisy chain the aMEGA with third party hardware, we strongly recommend that you try the combination before you buy it. This recommendation extends to any mix and match combination of Amiga peripherals which are not made by Commodore. As a rule, peripheral makers will guarantee compatibility only with the host computer or their own matching products. *—Morton Kevelson*

PAPERCLIP II
Batteries Included
Commodore 128
Disk; $79.95

Batteries Included has taken their well-known C-64 word processor, *PaperClip,* and converted and improved it to run on the C-128. They've added telecommunications functions and more printer drivers and taken advantage of the 1571's faster loading capability, as well as its autoboot. *PaperClip II* will read and write documents in PETASCII or normal ASCII in sequential or program files. It runs in 40- or 80-column mode on appropriate monitors. *SpellPack,* the spelling checker, is included.

Like any good word processor, it offers all the now-standard features like insert mode and variable margins and line spacing. Rather than repeat all these features, we'll deal with the most outstanding improvements. (For more information on the features of the original *PaperClip,* please read the full-length review in the January 1985 issue of *Ahoy!*)

One improvement that stands out immediately is the addition of word wrap. Instead of breaking a word at the end of a line, *PaperClip II* will find the beginning of the word and move the whole word to the beginning of the next line. Proofreading becomes much easier this way.

Another difference is the easy access with dual drive and two drive systems. It is no longer necessary to enter the drive identifier each time a disk access is done. I found the disk handling to be excellent. Error messages appeared when appropriate and didn't seem to lock the system up.

Directories can even be handled as word processing files, making it easy to create disk labels or compilations of disk file data.

Printer Support

I was happily surprised to see the large number of printers supported. All types of Commodore and most third-party printers were listed in the manual's printer section. The manual makes no mention of how to deal with printer interfaces, mainly because it expects the user to lock the interface in transparent mode and then let *PaperClip II (PC II)* do all the work. In the rare case where a printer is not supported, it is fairly easy to design your own printer driver, and the instructions for this in the manual are very well done.

Once I had locked my interface properly, my printer duplicated the printer test document perfectly. Boldface, underline, italic, super- and subscripts in four different type sizes all printed correctly. Combinations of these features also worked properly.

PC II can address printers through the serial port, through an RS-232 interface attached to the user port, or through a parallel adaptor attached to the user port. In addition, it will output print files to the video display or to a disk file. This disk file output is a good way to prepare text for transmitting via the built-in telecommunications module.

Telecommunications Features

The telecom module has all the features of most modem programs and then one. Most files received will have hard carriage returns at the end of each line, making it impossible to reformat the file to new margins. *PC II* includes an unformat command that will remove these carriage returns and replace them with spaces.

PC II will work with most commonly available Commodore compatible modems, including those that auto-answer/auto-dial.

Assorted Features

PC II's variable block feature lets you merge information from one file to another. With it you can print multiple letters with different addresses and other variable information. Variables can be read in from a file or entered manually at time of printout.

READER SERVICE INDEX

The publisher cannot assume responsibility for errors in the above listing.

Another of *PC II's* nicer features is its column mode. While some other word processors offer column mode, *PC II* also allows sorting of information in the columns. Columns and rows containing numeric data can be summed as well. This facility makes handling tables of data very easy.

A feature that is rarely seen in word processors for low-end computers is an automatic table of contents generator. By entering headings in the text and designating them as being in the contents, the program will write each of these along with its page number to a new file. The compiled listing can then be edited just like any other text file or used as is.

A related feature allows you to print chapter headings on each page. As with other good word processors, *PC II* lets you put automatically incrementing page numbers in your headers and footers. In addition to this, though, *PC II* lets you put in a chapter note that can be changed at will.

Headers and footers are easy to add and they can have different margins from the main body of text. They can also be printed using special characteristics like boldface, italic, or an alternate type size, provided your printer supports these features.

PC II has a limited file size of 499 lines by 80 columns or 999 lines by 40 columns. However, with its linking features this is not really a problem. The links can be specific or nonspecific. With the non-specific, you don't put the next file's name in the link command. At printout, the program will ask for the next filename. This can be very useful in cases where you may want to change the print order of the files to be printed.

Another useful aspect of the nonspecific link is the external file link. In this case, a separate file is created that lists all the files that are to be linked together. When this file is "printed," it will call in each link as it is needed. Via the external link file you can also change things like margins and print size.

PC II even includes an option to copy all linked files from one drive to another with one command. This vastly simplifies making backup copies of your files.

Another unique feature is the definition of instant phrases. You can designate one phrase for each alphabetic character on the keyboard. Including the capital letters, that's 52 possible phrases. Once a phrase is set all you need do to write it into the file is to hit the ESCAPE key and then the letter. For instance, I could designate that W=word processor. Instead of typing "word processor," I would only need to hit ESCAPE and W to put the words into my text. Each phrase can be up to a line long.

Another interesting phrase manipulation is changing the case of a phrase. While a phrase that is in the text can be defined and then moved, copied, or deleted, you can also change its case from lower to upper or back.

Spelling Checker

SpellPack is a pretty standard spelling checker. One of its most notable features is that it can be copied to a double-sided disk, allowing you to expand the dictionary to 100,000 words. Incorrect words can be changed from within the spelling checker. You can designate a corrected spelling as "universal," in which case the word will be replaced everywhere it occurs in the text. Another difference from other spelling checkers is the ability to remove words from the dictionary. Few spelling checkers offer this option.

Copy Protection

PC II is not copy protected like many programs sold these days. Instead, *PC II* comes with a "key" that fits into the second joystick port on the 128. Without the key the program will not run. You may create as many backup copies as you feel you need. And the documentation recommends working only from a backup disk.

Documentation

This program is one of the best documented that I've seen. A short tutorial (contained in a separate book) can be used to get started without reading the entire user's guide. The



table of contents is excellent. The index is not as nice as I would like, but still useful. The appendices include a command summary, format directives summary, printer file listing with instructions for custom files, printer connection information, and utility programs data. The utility programs are used to create working backup disks with or without autoboot.

Conclusion

I haven't seen a better word processor for the C-128. As far as features go, I can see none that this program doesn't have and several that I haven't seen in other programs. The $79.95 price tag is not so high considering that it includes *SpellPack.*

Batteries Included, Inc., 30 Mural Street, Richmond Hill, Ontario, Canada L4B 1B5 (phone: 416-881-9941).

–Cheryl Peterson

SUPERCAT DISK CATALOG SYSTEM
Commodore 64
Cornucopia Software
Disk; $29.95

Before I get into the nuts and bolts part of this review, I'll have to give you a little information about myself so you'll understand how I approached this task. First off, I'm not a very organized person. I seldom find missing items until six months after I've given up looking for them. The reason for my disorganization? Simple laziness. Organization means work. While I'm perfectly willing to earn a living and do those tasks necessary for day-to-day survival, I draw the line where work and play start to overlap. A perfect example is the monumental task of organizing my disk library. As I write this review I am sitting at a desk that has close to 1000 disks piled on top of it in various stacks and mounds. My one concession toward the organization of this mess is to try to keep games in their piles and utilities in theirs. Were you,



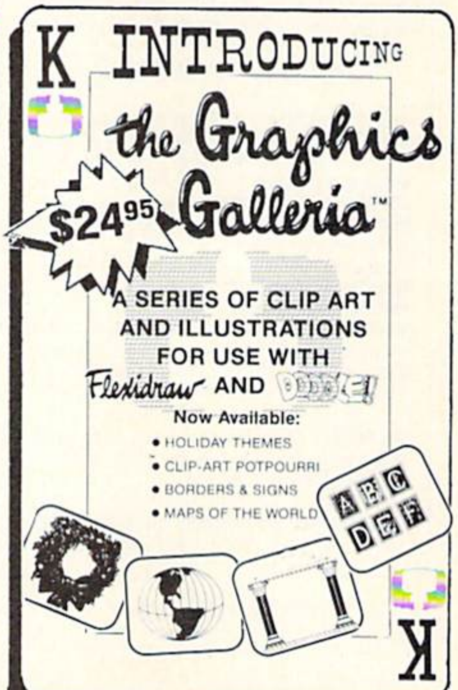
the reader, to peek over my shoulder, you'd spy a large mountain between the two aforementioned piles consisting of those disks that don't fit into either category. Some also fit into both categories. With this in mind it becomes obvious that for me to like any program designed to organize my disks, it must be simple and easy to use. And using it must not involve anything that resembles work.

Now, let me tell you about the *SuperCat* disk catalog system.

Right from the beginning I had my doubts. To start with, the user is told in the introduction that he or she must produce two additional disks to properly utilize the program. Just what I need: two more disks to add to the mountain. Realizing that two more disks on the pile wouldn't make a noticeable difference, I proceeded to read the remainder of the well-illustrated documentation that came with the program. Disaster! The manual, while containing many fine photographs and being nicely typeset, confused me so badly that I almost gave up. If it were not for the fact that this review was already sold, I might have. Tossing the documentation booklet on top of my largest pile of disks, I fired up an MSD dual drive and loaded the software.

What little information I was able to absorb from the documentation told me how to go about setting the software up to work properly with my system configuration, and I went ahead and did so with no trouble. The program's menu-oriented screens were a big help here, making each operation a simple matter of hitting certain keys and answering a few questions. I soon found myself ready to start the process of cataloging my disk-based version of Mount Everest.

How easy it was! All I had to do was insert the disk I wished to catalog, press a key, make a few selections, and assign the source disk a number. If I felt too lazy to do even that minor task, the software would



Reader Service No. 213

do it for me! Even a veritable sloth such as myself could quickly and easily convert a decade's worth of randomly acquired files into something Felix Unger would be proud of.

Now that all of my disks, and their associated files, have been cataloged, finding a particular file or program has been changed from an all-day job into a simple scan of my master directory. Should I want to, I can even generate a printed listing of all my files sorted alphabetically. The contents of each individual disk can also be printed out in a number of different ways. I can print them out in their numerical order, by catalog date, or by disk header, and I can even print out nifty disk labels that tell the disk number and its contents. When printing by disk header the listings can be sorted by disk name, blocks free, disk ID, catalog date, or disk number.

As you can see, this is a very powerful and versatile program. Unfortunately, true power is seldom without its flaws, and this program is no exception. During its use I found several minor glitches and one major bug that actually caused the program to break and display an error message. There are also places during the program operation where things could have been made easier for the user, as well as places that will totally confuse most people. The latter could have been prevented by better documentation, and this is one of the major faults of this utility.

When taken as a whole, the pluses of this program far outweigh the minuses, and I am now very comfortable with it. I don't think the $29.95 price tag is unreasonable, even with the flaws mentioned. For your money you end up with a program that does exactly what it claims to do and does it quickly and painlessly. Each package also includes a free backup disk of the program, and registered owners are kept informed of changes and updates to the software as they are made. Several of the large software manufacturers could learn a valuable lesson in the "quality received for money spent" department from this small company, despite their faulty documentation.

One final note to any of my fellow lazy folk out there. After you've managed to wade through your very own mountain of disks and finished cataloging them, your task is not done. For cataloging to be useful you must also update your catalog as needed. The best way I've found to do this is to put any new disks, or any disk with new files, in a separate disk holder and recatalog them on a weekly basis. This will insure that your catalog listing is fairly current and keep chaos at bay.

Cornucopia Software, P.O. Box 2638, Portland, OR 97208 (phone: 503-284-8557). *–B.W. Behling*

VISION 11.0 BBS

Vision Software Company
Commodore 64
Disk; $89.95

When I first reported on the *Vision 8.5* bulletin board software in our July 1985 issue, I was convinced that its author, Danny Dillulio, had created the best BBS program possible for the Commodore 64. I was certain that there would never be another piece of software to equal or (snicker) surpass it.

I was therefore amazed when I got my first glimpse of *Vision 11.0.* What Danny Dillulio and partner Bob Weiss have done to *Vision* is nothing short of incredible! Just as *Vision 8.5* made all previous bulletin board software appear sickly by comparison, *Vision 11.0* leaves the current competition far behind.

If you've ever hesitated to buy a BBS package because you thought such a thing was too complex for you to operate correctly, you'll be amazed at how simple the *Vision 11.0* system is to set up and use. Aided by the clearly written documentation, the first-time user can expect to have a workable BBS up and running after just a few hours' work. Also, the same system that you put up in one day can later on be expanded to a size limited only by how much disk storage space you choose to use. And *Vision 11.0* is not limited to just the Commodore 1541 drive. It is fully IEEE-compatible (with the proper interface), allowing the use of disk

drives supporting one megabyte or more of storage space. While other systems limit you to building a BBS, *Vision 11.0* encourages you to build an empire.

Vision 11.0 is modem-specific and comes with three versions that support the Commodore 1670 and 1650 modems as well as most Hayes-compatible modems. All but the 1650 version support 300/1200 baud operation. The system operator also has the ability to restrict access to the system to only 300 or only 1200 baud users, as well as locking out new users for a totally private BBS. Each *Vision 11.0* system also has a built-in, multitransfer terminal program that can be accessed by the system operator directly from the waiting for caller screen.

Uploading and downloading of program and sequential files is handled using Punter 10, XMODEM (both CRC & checksum), and ASCII protocols. Upload and download bank accounts encourage users to upload as often as they download. SysOps can award users who upload with from 1 to 99 downloading blocks for each block uploaded. A handy auto lock feature can be implemented on all uploads to allow the SysOp time to review any uploads before releasing them to the general BBS population. This feature also makes it possible to restrict access to certain files to a select group of users through the use of passwords.

The fully modular construction of *Vision 11.0* makes future updates and expansion, as well as the insertion of operator-written program modules, a snap. The game module feature keeps users coming back again and again. Several online game modules are included with the system and have proven to be very popular with most users (two programs that I wrote for *Ahoy!* have been converted into game modules for use on the *Ahoy!* BBS). SysOps may also add their own game modules with ease, since these modules are in BASIC. Full documentation on how to create modules is included with the BBS package.

Many users of *Vision 8.5* complained about its text editor's lack of features, and these complaints were listened to and acted on. The system now features a full-fledged message editor that supports line insertion and deletion, line editing, and line centering commands. Also changed is the old 50-line or 800-character limit of version 8.5. The new system now gives each message a full 50 lines without counting characters. Wordwrapping has also been added, eliminating carriage returns at the end of each screen line. The message bases themselves have also been modified to allow first in, first out message handling for truly maintenance free message bases. A bulk E-Mail feature allows messages to be sent to all users or only a selected group of users.

Gone also is *Vision 8.5's* 0 to 99 security levels. These were replaced with multiple access groups which allow for anything from a single system with several levels of security to ten separate systems combined in one.

One other new feature included in this version is the ability to network a group of bulletin boards together to form a single system featuring full exchange of messages and private mail. This feature would allow a large company or national user group to

establish bulletin boards in major cities and keep messages on each system current with all the rest. A very nice feature indeed, and the authors are to be complimented for including it.

While space does not permit us to expand on all of *Vision 11.0's* features, we'll briefly note the following:

Full remote SysOp access allows operation from across the street or across the country.

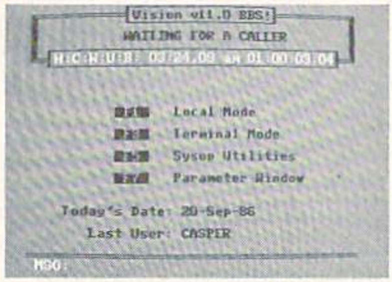
Pull down SysOp window allows easy, full editing of user status while the user is online.

SysOp created command menus allow unparalleled flexibility. Users will see only the selections you want them to see (relative to their security level).

An online bar chart shows full system daily activity.

Easy to create questionnaires get users' opinions and feedback on any subject.

A full 80-column output screen that is user-toggled from the BBS menu.



Vision 11.0: ***the only BBS for*** **Ahoy!**
READER SERVICE NO. 229

Vision 11.0's concise documentation, tremendous flexibility, smooth operation, and fantastic customer support make it the best buy in bulletin board software for the C-64. It is the only C-64 BBS I've found that meets all of the needs of the *Ahoy!* magazine BBS. Give the *Ahoy!* magazine BBS a call at (718) 383-8909 for a firsthand look.

Vision Software Co., P.O. Box 534, Bronx, NY 10461 (phone: 212-829-1538). *–B.W. Behling*

USER CONVENTIONS

For the C-64

By Edward G. Bell

User Conventions is a utility to create 'cheat sheets' for your software. Such products are available commercially, but there is still a need that goes unfilled. For instance, have you ever typed in a great game or utility? If you use it every day, you may remember all the commands and functions and addresses, but that is not the way it usually works, especially for machine language programs. Most such programs would not generate enough profit to produce reference cards commercially, but they are important to you, and the commands are still often a trial to remember. Even if you could access the original article quickly, wouldn't it be nice to have a list of the most frequently used commands at your fingertips?

With that in mind, *User Conventions* offers a solution to the problem—eight functions to aid in creating neat, inexpensive reference sheets for all your programs:

f1 ENTER DATA	f2 DELETE FILES
f3 DIRECTORY	f4 MODIFICATIONS
f5 DISK CONTENT	f6 HARD COPY
f7 LOAD FILE	f8 BORDER COLOR

Each routine contains all needed instructions for use.

User Conventions is a hybrid program, part BASIC and part machine language. The ML routines load into the C block of RAM (49152) and are self-contained. They require no parameters from BASIC, except to change the color of the top screen and border. This was intentional, allowing you to incorporate them into your own programs, and since this memory is not used by BASIC, there is no sacrifice of BASIC RAM. Consult the accompanying chart on page 76 for start addresses of these routines.

There are five characters redefined in *User Conventions,* all punctuation, which avert filing complications. This is done by ALL ML.OBJ, another useful utility that you can use in your own work. This routine, a block move, turns off the interrupts, switches I/O out and character ROM in, transfers a complete character set down to 2048, and changes the necessary pointer to the character bank. It then redefines characters 195-199 and returns control to the BASIC program.

BASIC loads at 4096, above the character set. There are definite advantages to doing things this way. You are freed from any worry of overwriting your characters with variables, and the character set creates no upper limit in RAM. This is accomplished by setting the bottom of BASIC pointer at address 43/44 prior to loading. You must either use the BOOT to load and run the program or enter the proper POKEs before loading. To incorporate this feature into your programs, just use the BOOT, but substitute the name of your program in the LOAD command.

Incidentally, you are asked by the BOOT for the device number of your drive. This is the device number that will be accessed in all disk operations. To preserve this number, it is POKEd into memory, then PEEKed into a variable after loading. You see, it would otherwise be lost because the BOOT uses the "dynamic keyboard" to configure memory and load the main program.

The most important function of this program is to create reference cards for my programs. This is accomplished by the ENTER DATA option. You may enter COMMANDS of up to 28 characters. For convenience, the four odd numbered function keys are predefined as common command keys (FCTN-, CTRL-, SHFT-, and CMDR-). If you find it necessary, or desirable, you can redefine one or all of them to suit your needs by pressing f4. F2 is unused, so if you feel ambitious, you can even have five predefined function keys. F6 will send you to the filing routine, and f8 is an escape to the menu.

After you enter a COMMAND and verify it, you must describe it. A DESCRIPTION may be up to 80 characters long. If you are satisfied with your DESCRIPTION, just position the cursor over 'Y', 'TO CONFIRM', and press RETURN.

If you require more than 80 characters, when you are asked to confirm your DESCRIPTION, press RETURN while the cursor is over the 'UP ARROW', 'TO CONTINUE'. The next COMMAND will become 'CONT.' and the part of the DESCRIPTION you just entered will be displayed in pink for reference. Now you can enter another 80 characters. You can do this twice, for a maximum of 240 characters for any COMMAND. This is due to the limit of 255 characters in a BASIC string, and the limit of 80 characters that can be input from a disk with the INPUT# command. GET# would have avoided this limitation, but the access time would have been unacceptable.

If you should require more than 240 characters, enter something like "command (cont.)" for the next COMMAND, then enter more DESCRIPTION as usual. Don't try 'CONT.' This has a special meaning in the display routines, and you cannot enter it as a command.

The program is dimensioned for 100 records. If you want more, you must redimension the array, but since

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the program is only a little better than 8K *with* the character set, the potential is really unlimited for all practical purposes.

When you have entered your data, the file will be created, including the program name, magazine or source of the program, the issue month and year, and the page of the article. You must confirm each of these entries. This DATA cannot be changed later.

All other file data can be updated or edited at any time, adding, deleting, or modifying records. Try that with the commercial products!

Onscreen instructions walk you through each process. In the modification routine, each command and each part of its DESCRIPTION will be displayed. You have several options open to you. The <S>croll option allows you to scroll from COMMAND to COMMAND. When you select this option, you must follow it with a carriage return to enter the scroll loop. Then, by either holding the 'S' key or pressing it repeatedly, you can search the COMMANDs until you find the one you want to edit, or the end of the file. When you find the desired record, just press RETURN and you will reenter the normal modification loop. If you scroll to the end, if you have made no modifications, you will return to the menu. If you made any changes, the file will be rewritten first.

If a record has a leading or trailing space, a ball (shifted 'Q') will be displayed in the MODIFICATION routine to notify you. Special consideration had to be given to these spaces to preserve them when writing and reading from the files.

You may shorten an existing DESCRIPTION and delete any unneeded parts, but if you must make it longer (within the 240 character limit) you must delete the COMMAND (which will delete all of its corresponding DESCRIPTIONs), file the change, then use the 'ADDITIONS' function of the modification routine, which will append the new record to the end of the file.

You can edit one or all records of a file. Just make the desired changes and press 'F' at the next COMMAND to exit to the filing routine, or go through the whole file, and if any changes were made, the file will be rewritten. Entering "E" at the COMMAND will provide escape to the menu with no changes to the file.

The DIRECTORY option and the DISK CONTENT option are ML routines which display the disk directory. The difference between the two is that DISK CONTENT displays all files on the disk, whereas DIRECTORY reveals only the files that are created by USER CONVENTIONS, or, more particularly, those files that start with the characters 'CONV.'. You can use both of these in your programs, with a SYS call to DISK CONTENT, or POKEing the name or part of the name (pattern matching is allowed, 16 CHARACTERS MAX. followed by a '0') into a buffer and calling the DIRECTORY routine.

You may get neatly formatted output to screen with LOAD FILE, or to your printer, for a reference sheet, with HARD COPY. I use the VIC 1525. If your printer is a dot matrix that recognizes the same escape codes (14,15, and 16) there will be no adjustment required.

TYPING IT IN

The program has been crunched mercilessly. It started out at almost 20K, and now is about 8K including the ML. This was to keep the program short, consume as little RAM as possible, and maximize execution speed. The ML portion must be entered using *Flankspeed* (see page 101). It starts at 49152 and ends at 50228.

I think you will be surprised at how much is crammed into this program. It is fast and versatile, both in what it does as a whole, and what the individual parts can do for your programs. I hope you find it as valuable as I do. □ *SEE PROGRAM LISTINGS ON PAGE 121*

SYS ADDRESSES

49152	Display files starting w/"CONV." Any characters can be tested for by POKEing them into buffer starting at 50048. File names or parts of filenames can be found using pattern matching characters '*' and '?'. Terminate buffer entry with '0'.
49159	Displays all files on disk.
49178	Byte that holds device number for disk operations. Default is 8.
49591	Clears and fills top screen with blue reverse spaces, giving appearance of split screen.
49604	Changes color of top half of screen and border. Byte that holds color value is at 49799.
49625	Clears lower half of screen by filling w/ASCII 32.
49655	Block move and character redefine routine.
49799	Byte which holds value for color of top half of screen and border.
50048	Buffer that holds test value for routine at 49152. Any characters can be put here, 16 characters max. + '0' terminator (e.g.: FILENAME0, FILE*0, F?LE0, ????.*0)
50228	End of machine language routines and data.

BASIC LINE MAP

1-8	Housekeeping.
8-17	Various subroutines.
18-26	Function key redefinition.
27-30	Menu.
31-32	Change border color.
33-52	Data entry loop.
53-60	Program data input.
61-63	Spring board for all file reading operations.
64-74	Screen display of Conventions file.
75-82	Printer output of Conventions file.
92-93	Disk directory / content routine calls.
94-97	Space bar input prompt.
100-147	File modification routine.
148-152	Line wrap routine.
153-155	File deletions.
156-171	Input of filenames, program name, month, year, source of program.
172-205	Input of commands, descriptions, and key redefinitions.
206-207	Disk error test.
208-215	Read convention file.
216-222	Write convention file.
225-234	Adjustment for display of commands and descriptions on top half of screen.

TIPS AHOY!

Compiled by Michael R. Davila

We'd like to keep *Tips Ahoy!* the Commodore community's number one forum for short, helpful programming routines. To that end, we invite you to forward your best efforts to:

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MEMORY TRANSFER

This short routine may help when programming games, or when you need to transfer data from one memory location to another. It will put your entire screen into memory starting at location 49152. You may change that by replacing the value of I to the desired starting point. You then can go on and clear the screen or load up new programs and still have that old screen in memory. Typing in the following program will put your screen in memory and clear the screen. Hit any key and the screen will come back again.

```
10 I=49152:FORX=1024 TO 2023:U=PEEK(X):P
OKE I,U:I=I+1
20 NEXT X
30 PRINT CHR$(147):GETA$:IF A$=""THEN30
40 I=49152:FOR X=1024 TO 2023:U=PEEK(I):
POKE X,U:I=I+1
50 NEXT
```

By adding the following line, you can make your screen come back upside down. This is an interesting routine and can be put to use in many ways.

```
40 I=49152:FORX=2023TO1024 STEP -1:U=PEE
K(I):POKE X,U:I=I+1
50 NEXT
```

—Chris Jones
Oak Ridge, TN

HACKER'S DELIGHT

I have written a simple routine to check sectors on one disk against a copy of the same disk. It is very helpful for copy protected programs which alter the directory. It will request a track and sector. It will then read the track and sector of the original disk in the drive. It will then ask for the copy disk to be inserted and read the same sector on the copy disk. If any bit is different it will tell you.

The offending bit can be rewritten with the bit from the original disk using the block write command in the manual.

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Reader Service No. 200

–Steve Stutts
Loretto, TN

```
•5 DIMA$(255):DIMB$(255)
•6 PRINT"[CLEAR]":PRINT"[5" "]SECTOR COMP
 ARER BY STEVE STUTTS":PRINT
•20 INPUT"TRACK";T
•30 INPUT"SECTOR";S
•40 GOSUB1000
•170 FORI=0 TO 255
•180 GET#5,C$:IFC$=""THENC$=CHR$(0)
•190 A$(I)=C$:PRINTI,ASC(C$)
•200 NEXT
•201 CLOSE5:CLOSE15
•205 PRINT"INSERT SECOND DISK":PRINT"PRES
 S RETURN WHEN READY":INPUT Z$:GOSUB1000
•210 FORI=0TO255
•220 GET#5,C$:IFC$=""THENC$=CHR$(0)
•230 B$(I)=C$:PRINTI,ASC(A$(I)),ASC(C$)
•260 IF A$(I) <> B$(I) THEN PRINT"ERROR B
 IT # ";I;"TRACK ";T;"SECTOR ";S:GOSUB500
•270 NEXT
•280 CLOSE 5:CLOSE 15
•290 INPUT"AGAIN Y/N";Z$:IF Z$="Y"THEN 6:
 ELSE GOTO280
•500 INPUT"CONTINUE Y/N";Z$:IFZ$="Y"THEN
 RETURN:ELSE GOTO280
•1000 CLOSE15:OPEN15,8,15
•1010 CLOSE5:OPEN5,8,5,"#1"
•1020 PRINT#15,"U1";5;0;T;S
•1030 RETURN
```

DICE

Are you interested in writing games in which one or more dice are rolled? Do you want the graphics to be attractive and the random numbers to be truly random? If so, here is a machine language dice rolling subroutine which you can use in any of your programs.

This subroutine is nearly perfectly random in its choice of numbers. A test of its random nature showed that in 25,000 rolls, the range from the value which occurred the fewest number of times to the value which occurred the highest number of times was less than 1.5% away from being perfectly random.

The installation and use of the *Dice* subroutine is simple. To install, first add a GOSUB 50060 to the beginning of your program, then append lines 50060 to 50100 and 50160 to 50310 from Listing 1. To roll each dice, simply POKE 781,row and POKE 782,column. Row and column are the locations on the screen where the dice should be placed. Next enter a SYS 49152. The value of the dice can be read with a PEEK(781). The following lines are a demonstration of the *Dice* subroutine:

```
•100 GOSUB 50060
•110 PRINNT"[CLEAR]"
•120 POKE 781,5:POKE782,10
```

```
•130 SYS 49152
•140 RL=PEEK(781)
•150 PRINT"[HOME]";RL
•160 END
```

This short program displays the dice at row 5, column 10 and the value of the spots at the top of the screen.

The *Dice* subroutine can be moved to the start of any page by first changing all ten of the 192s in the listing to whatever page you wish to use, then POKEing the subroutine into that location. For example, moving the subroutine to 51200 ($C800) would require a change of 192 to 200. If you move it into the BASIC workspace, be sure to protect it from BASIC variables.

The *Dice* subroutine can also be used from an assembly language program. To do so, add the following lines:

```
LDX #row
LDY #col
JSR $C000
```

The value of the roll of the dice is returned in the .X register.

—Richard F. Daley
Sally J. Daley
Darby, MT

```
•50000 PRINT "[CLEAR][DOWN][DOWN]LOADING.
  . ."
•50010 CT=0: LO=49152: I=0
•50020 READ A: IF A>255 THEN 50050
•50030 POKE LO+I,A: CT=CT+A: I=I+1
•50040 GOTO 50020
•50050 IF CT<>20611 THEN PRINT "[DOWN]ERR
 OR IN DATA STATEMENTS!": STOP
•50060 FOR I=0 TO 7: POKE 781,14: POKE 78
 2,I*5
•50070 SYS 49152:NEXT I
•50080 PRINT: PRINT "[DOWN][DOWN]DICE SUB
 ROUTINE LOADED!"
•50090 END
•50100 DATA 24,32,240,255,169,60,160,192,
 32,43,192,173
•50110 DATA 4,220,77,18,208,41,56,74,74,7
 4,201,6
•50120 DATA 176,241,72,10,170,189,118,192
 ,168,189,117,192
•50130 DATA 32,43,192,104,170,232,96,133,
 34,132,35,160
•50140 DATA 0,177,34,240,6,32,210,255,200
 ,208,246,96
•50150 DATA 117,99,99,99,105,17,157,157,1
 57,157,157,98
•50160 DATA 32,32,32,98,17,157,157,157,15
 7,157,98,32
•50170 DATA 32,32,98,17,157,157,157,157,1
 57,98,32,32
•50180 DATA 32,98,17,157,157,157,157,157,
 106,99,99,99
```

```
•50190 DATA 107,145,145,145,157,157,157,1
 57,0,129,192,133
•50200 DATA 192,139,192,145,192,157,192,1
 71,192,17,29,113
•50210 DATA 0,113,17,17,29,113,0,113,17,1
 13,17,113
•50220 DATA 0,113,32,113,17,17,157,157,15
 7,113,32,113
•50230 DATA 0,113,32,113,17,157,157,113,1
 7,157,157,113
•50240 DATA 32,113,0,113,32,113,17,157,15
 7,157,113,32
•50250 DATA 113,17,157,157,157,113,32,113
 ,0,256
```

KOALA READER

You're probably aware that the Koala Pad is an input device like the joystick or keyboard, but since it isn't accurately readable using BASIC, you may not use it in your own programs. *Koala Pad Reader* can be added to your BASIC program to make using this versatile device easy. Once the routine is POKEd into memory, SYS 49152 will read the location of pressure on the pad plugged into Port 2. PEEK(820) then returns the x-coordinate and PEEK(821) the y-coordinate. (These coordinates range from 0 to 255.) PEEK(822) will return 4 if the left button is being pressed, or 0 otherwise. PEEK (823) will return 8 if the right button is pressed, or 0 if not. A simple demonstration follows, the program but the reader program must be separately run before it will work.

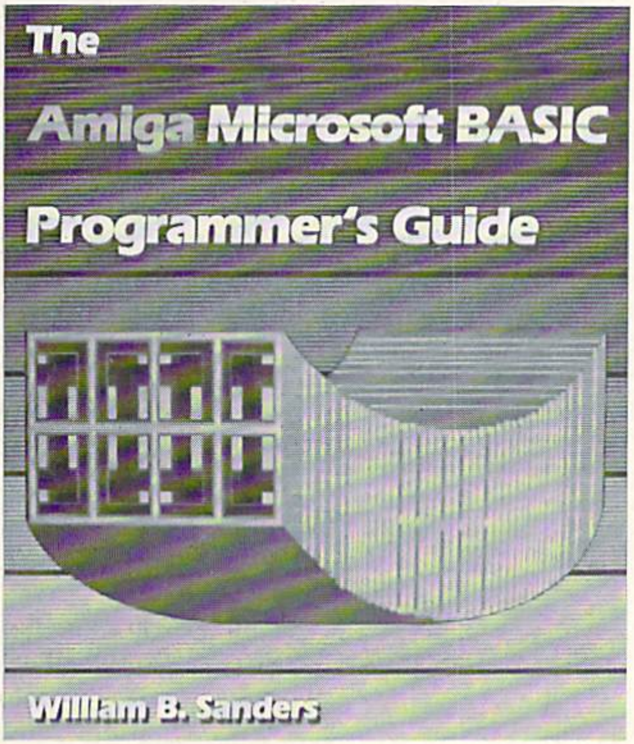
—Paul Sobolik
Pittsburgh, PA

KOALA PAD READER

```
100 REM C-64 KOALA PAD READER
110 FOR X=0TO64:READA:POKE49152+X,A
120 CK=CK+A:NEXT
130 IFCK<>7277THENPRINT"DATA ERROR":END
140 DATA 120,173,2,220,141,63,192,169
150 DATA 192,141,2,220,169,128,141,0
160 DATA 220,160,0,136,208,253,173,25
170 DATA 212,141,52,3,173,26,212,141
180 DATA 53,3,173,0,220,73,255,141,64
190 DATA 192,41,4,141,54,3,173,64,192
200 DATA 41,8,141,55,3,173,63,192,141
210 DATA 2,220,88,96,0,0
```

KOALA PAD READER DEMO

```
100 KOALA PAD READER DEMO
200 K=49152:C=820
300 SYS K
400 X=PEEK(C):Y=PEEK(C+1):LBUTTN=PEEK(C+
2):RBUTTN=PEEK(C+3)
500 PRINT"[CLEAR][HOME]X: "X,"Y:"Y;
600 IF LBUTTN THEN PRINT"LEFT"
700 IF RBUTTN THEN PRINT"RIGHT"
800 GOTO 300
```



A step by step guide to mastering Amiga Microsoft BASIC, this new volume demonstrates a number of advanced features. Included is extensive coverage of pull-down menus and mouse control, and an artificial intelligence program. READER SERVICE NO. 226

SCUTTLEBUTT

Continued from page 14

QuantumLink has set up a special area to let its members participate in a $500,000 treasure hunt. The money is stored in a safe deposit box, the key to which is hidden in a gold horse buried somewhere in the continental United States. The location of the horse was first revealed in a puzzle published in the 1984 book and videotape, "Treasure"; however, no one has found it yet. The new QuantumLink area will let treasure hunters compare notes, post messages, and participate in group discussions on the topic.

Quantum Computer Services, Inc., 703-448-8700 (see address list, page 14).

New York Pulse provides Fun City area residents with information and reviews of restaurants, theater, film, arts, events, and other activities, along with travel, weather, business, and sports news. The charge is $7.50 per month, with connect time free weekday evenings and weekends and $6 per hour 7 a.m.-6 p.m., Monday through Friday.

Covidea, 516-937-7000 (see address list, page 14).

BOOKS

The *C-128 BASIC Training Guide* ($16.95) introduces the user to BASIC 7.0 with dozens of examples that lead to more advanced programming techniques.

Abacus Software, 616-241-5510 (see address list, page 14).

The Bard's Tale Hint Book ($8.95) is filled with factual information, listing all monsters, defenses, point values, and penalties, as well as providing detailed maps of every level.

Rocket Enterprises, Inc., 817-261-6582 (see address list, page 14).

Commodore 128 Programming Secrets ($15.95) ranges from fundamentals to sophisticated techniques, describing the 64, 128, and CP/M modes in detail and explaining how to use Kernal ROM and BASIC 7.0 to run faster programs, how to gain greater control over screen display with video RAM, and how to apply bank switching techniques to store and access additional programs. Also discussed are CP/M BIOS mapping, development of advanced text, graphics, and sound applications, memory management techniques, and control of disk and input/output operations. BASIC 7.0 dictionary and C-128 memory maps are included.

Osborne/McGraw-Hill, 415-548-2805 (see address list, page 14).

The Amiga Microsoft BASIC Programmer's Guide ($19.95) provides many examples of advanced features, both for beginning and intermediate users. Special attention is given to the computer's color graphics and voice synthesizer. The book explains how to create and customize software for individual needs, write learning games for your children, construct a simple database, integrate programs, and write multitasking programs in BASIC.

Scott, Foresman and Company, 312-729-3000 (see address list, page 14).

GAME RELEASES

Activision's *Aliens: The Computer*

Game ($34.95) lets C-64 gamers experience six segments of the movie in first person perspective: navigating the drop-ship landing from the military transport onto the surface of LV-426; rescuing marines under attack in the atmosphere processor, controlling the movements via biomonitors; fending off waves of aliens while attempting to escape from the operations room; leading surviving crew members to safety through a maze of alien-infested air ducts; rescuing Newt and destroying the Alien nest; and combatting the Alien Queen.

Created to be "the first true piece of computer literature," *Portal: A Computer Novel* ($39.95) allows the player to direct his research and control his experience in a more personalized manner than in text adventures. The adventure takes place in the year 2106, where the player returns from a 100 year voyage to find a deserted planet. He scans the Worldnet databases for clues, and discovers the sole survivor of the lost world: a biological computer called Homer.

Epyx, Inc., 408-745-0700 (see address list, page 14).

The latest import on Activision's Electric Dreams label, *Titanic: The Recovery Mission* ($29.95) requires you to uncover the mysteries of the submerged ship and bring her to the surface. You must continually raise money from backers to keep the mission going, hold press conferences to keep interest high, and explore the ship for clues and treasures. The more than 240 rooms and 170 objects in the C-64 game are patterned after those that existed aboard the real ship.

GFL Championship Football ($34.95) from Activision's Gamestar subsidiary gives the C-64 gamer a ground-level, on-the-field perspective, with scrolling screen animation providing the feeling of actually moving up and down the field while engaging in any of 34 offensive plays. Players select their team's style, then face another player or any of 27 computer-controlled opponents.

Activision, 415-960-0410 (see address list, page 14).

With SubLOGIC's *Stadium Disk* ($19.95), owners of *Pure-Stat Baseball* can play in any one of the 26 major league stadiums. Documentation is provided for each stadium, including dimensions and information on which stadiums favor hitters or pitchers. Also included are 10 classic teams of the past.

SubLOGIC Corporation, 217-359-8482 (see address list, page 14).

Four offerings from Electronic Arts: *Star Fleet 1–The War Begins* pits members of the Alliance against hostile forces from the Krellan and Zaldron Empires. Players begin as rookie cadets in the Star Fleet Officers Academy, with each new level giving them the chance to role-play specific characters and experience a unique set of tasks. After graduation, players command one of 36 galactic heavy cruisers in battle, rescuing starbases, capturing and towing enemy vessels, laying mine fields, and repairing damaged systems. $39.95 for the 64, $55 for the Amiga.

Moebius–The Orb of Celestial Harmony ($39.95) places a fantasy role-playing adventure into a martial arts environment. The goal is to recover a magical orb which has been stolen by a renegade warlord who is using it to upset the environmental harmony of the island kingdom of Khantun. Featured are extensive character interaction and a variety of magic charms and prayers.

Arcticfox, a supertank designed for polar combat, must be used to penetrate a force field set up by aliens attempting to poison the earth's atmosphere, overcome hostile forces, and destroy the enemy headquarters in the Arctic. $32.95 for the C-64; $39.95 for the Amiga.

EA will distribute *Quizam*, Interstel's space trivia game requiring one to eight players to capture eight satellites by answering questions from a pool of over 2000. For the 64; $29.95.

Electronic Arts, 415-571-7991 (see address list, page 14).

The object of *Destroyer* is to accomplish one of seven missions, ranging from escorting a merchant convoy to rescuing a shot down pilot, without being sunk. In all cases, the player-captain is faced with realistic situations requiring him to interpret radar and sonar reports, control depth charges, anti-aircraft guns, and torpedoes, repair damage, and delegate authority to the onboard computer.

From Strategic Simulations, Inc.: *Gemstone Healer* ($29.95), returns the C-64 user to the world of *Gemstone Warrior* to find that the jewel, though restored to its rightful place in the temple, has lost its powers due to damage. The warrior must return to the Demon's lair, locate the Healing Tools, and repair the Gemstone.

Wargame Construction Set ($29.95) lets players control weapons and firepower, fighting units, troop movement, and terrain. Eight predesigned scenarios are provided, including Civil War and World War II battles, a contemporary hostage res-

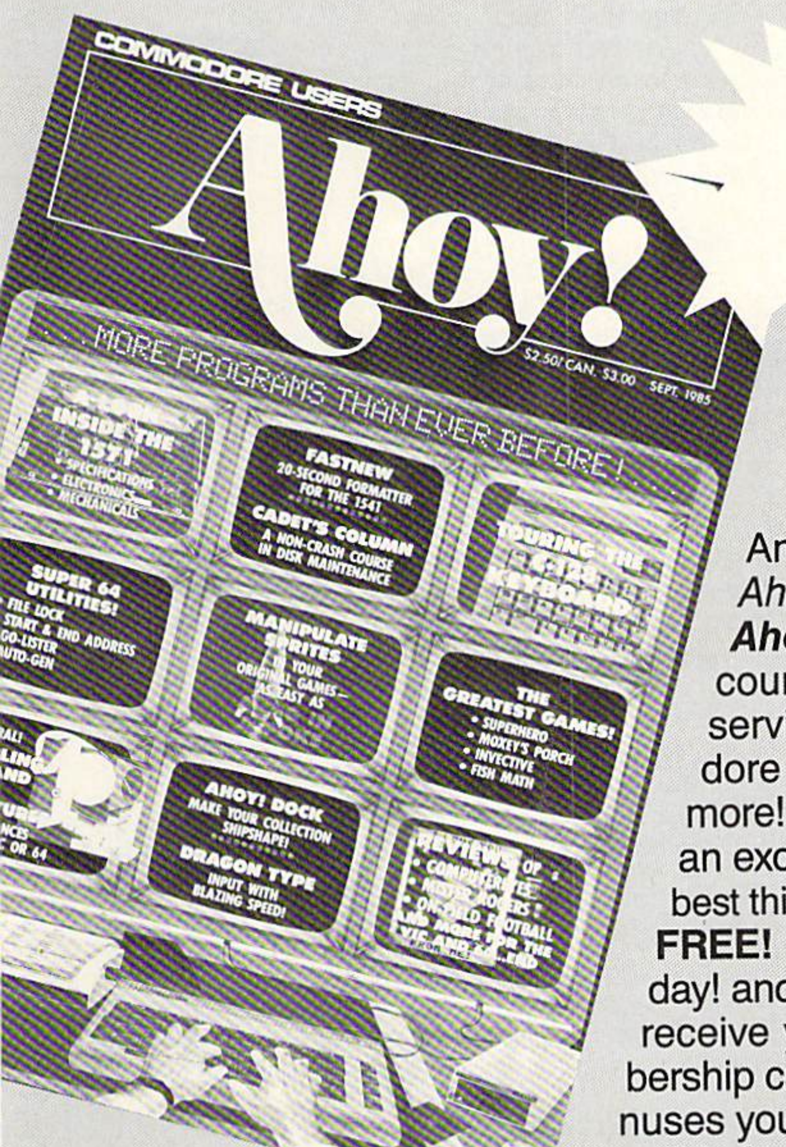
Continued on page 130

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High Resolution Screen Doubler and Scroller for the C-64

By Robert Bixby

One of the main selling points for the new generation of computers is extremely dense high resolution (hi-res) screens. The Commodore 128, for instance, offers a screen 640 picture elements (pixels) by 200. (They don't tell you, however, that it is all but inaccessible to anyone but machine language programmers because of its peculiar addressing characteristics.) The Amiga and Atari ST offer similar screens. What if the venerable old C-64 could offer a 640 × 200 pixel hi-res screen? Would that convince you to take it out of the closet and stop drooling over that Amiga?

I am a graphic artist in my spare time, and I appreciate anything that gives me greater control over the images I make with my computer. While toying with a hi-res scrolling routine I wrote, I was struck with the inspiration to scroll more than one memory territory across the screen. *SIXFORTY* is the product of that inspiration.

LINKING AND LOADING

SIXFORTY links end to end the territories which begin at memory locations 24576 and 32768. You can scroll to any place in these two territories with *SIXFORTY.* You can load graphics from a variety of graphics packages (as long as there are no memory conflicts). My preference is *DOODLE!* There won't even be a color memory conflict, because *SIXFORTY's* color memory starts 1024 bytes lower than *DOODLE!'s.*

THE PROGRAM

SIXFORTY consists of a BASIC loader which POKEs the machine language (ML) portion into memory and then saves it to disk as an ML program file which loads very quickly. You can save a copy of the ML portion any time *SIXFORTY* and *SIXFORTYMLA* are in memory at the same time. Simply enter "GOTO 60100".

I wrote the accompanying program *SIXFORTYBAS* to serve as a subroutine to a larger program (perhaps a graphics program the reader has written himself), but it can stand alone as a separate program. (See **Possibilities** section below.)

USE

Enter *SIXFORTYBAS* and save a copy of it to disk. Run it. Hitting the [H] key will take you to the hi-res screen. But you still can't see anything. Color memory is full of clutter, just like the rest of memory on power-up. You have to hit [C] to Clear color memory. *SIXFORTY* allows you to use any set of colors you want. I prefer black and white. Typing [T] will return you to the text screen. Finally, typing the back arrow key will scroll the screen. (You can scroll from immediate mode or from within your own program by entering "SYS49152".) The screen you see scrolling in at the right is the screen at 32768. The screen at 24576 scrolls into this region from the "right" also, making both screens a continuous band. If you want to use *SIXFORTY* as a subroutine, you will want either to alter line 61005 to return you to your main program or to enter another line so that typing [R], for instance, will return you to the main program.

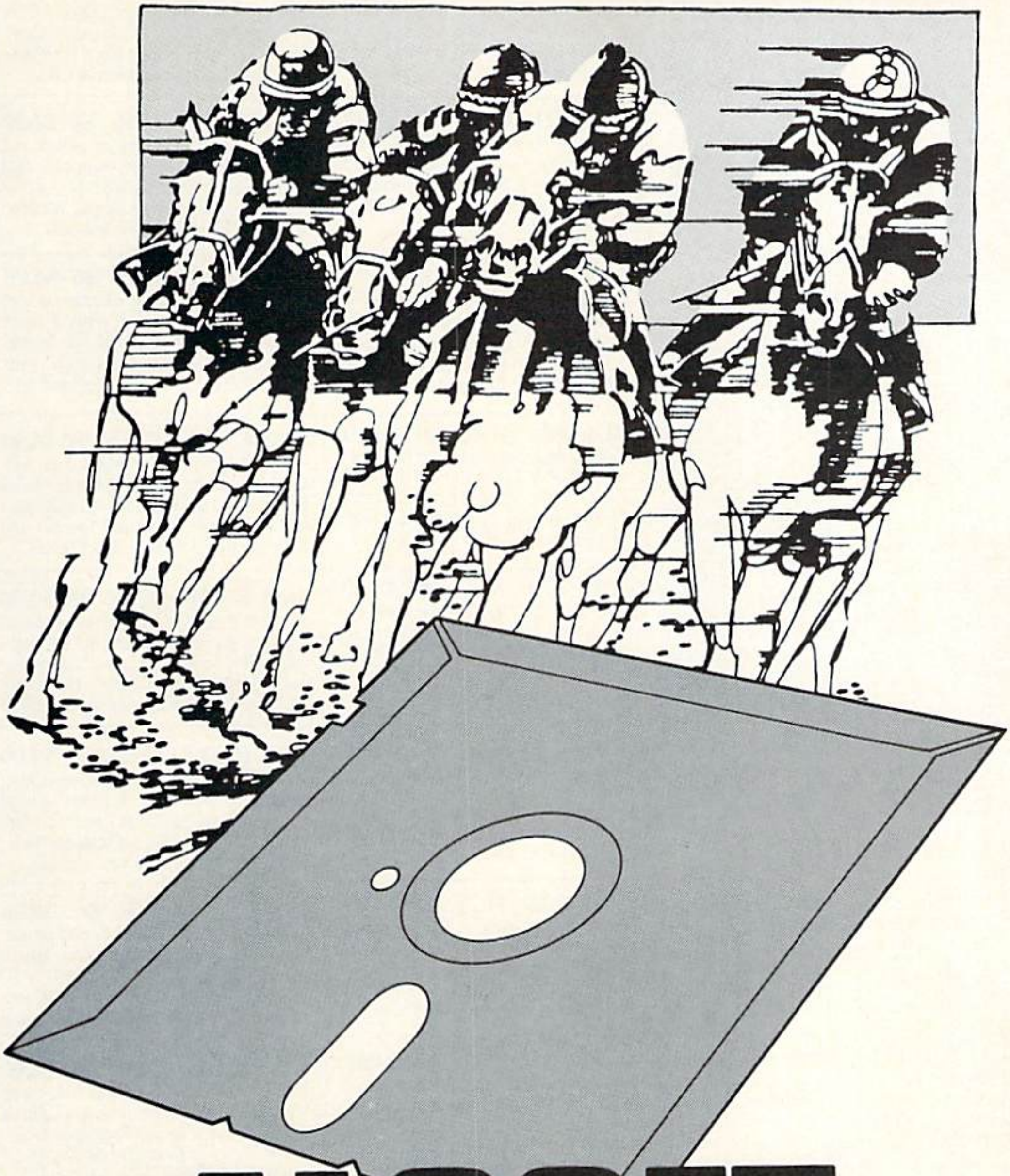
Since *SIXFORTY* delves rather low in memory, you will probably want to lower the top of BASIC. Use POKE 56,88. This will put the top of BASIC one byte beneath the color memory of *SIXFORTY.*

Load a *DOODLE!* or other hi-res graphic that resides at 24576 (LOAD"DD[filename]",8,1). Hit the back arrow key 40 times. You have a blank screen again, full of random streaks. Load another *DOODLE!* Hitting the back arrow key will now scroll the two graphics end to end.

POSSIBILITIES

SIXFORTY has great graphics possibilities. You can use it for a scrolling display, or you can double the horizontal resolution of your C-64 hi-res screen. You may want to use the scrolling feature for animation in games. ☐

SEE PROGRAM LISTING ON PAGE 109



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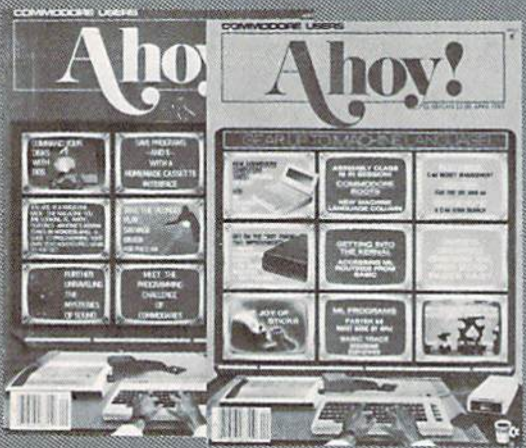
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THE ADVENTURER

For the C-64

By Jean-Francois Heon



You knew something didn't feel right when you walked into this town. Muffled whispers of gargoyles, more than your average share of missing townsfolk, and many other seemingly unimportant pieces of information now make sense. If only you had heeded your Guild-Master's advice…but no. Being the greedy thief your guild trained you to be, you couldn't resist trying this town.

Since you were caught stealing from a local church (I said you were greedy), your sentencing was left to the high clerics of the town. Your punishment, sounding too strange to be easy, is to carry a key and a weapon of your choice underground and return alive.

You chose a stiletto (of course) for its speed, and also because back at the guild you learned how to throw it so that it can return to you regardless of what it strikes; let's see men in plate mail try that! Hmm, you notice the key is numbered…it seems to be key one of a set. The numbers on the key are very worn and it seems to be of a set of somewhere between ten and nineteen, as the second digit is illegible.

The Clerics tell you that you must find and open all the coffers in the cavern below, and that they will only open in the order of the number on the key you have. This doesn't sound too difficult; you wonder why you needed a weapon. They did mention something about rooms with open coffers never being able to bother you again, but it didn't seem all that important.

You were pushed into a pit and landed some twenty feet or so from the hole above. You now realize that you're not getting back up that way. Whoa…Now there's a gargoyle heading right for you. A quick flick of the wrist and your stiletto finishes him off. There is a large coffer in this room. Well, it looks like you have your work cut out for you.

HOW TO ENTER

Enter the *Dungeon Maker* program from page 125 and save it to disk. Then RUN it once. This will take some time, but is only necessary the first time you play. The program will create a dungeon map and save the map as a file on the disk. Only after the *Dungeon Maker* has been RUN at least once can *The Adventurer* be used. Now you should enter and save *The Adventurer* from page 127 to disk. Then you can play it at any time by entering LOAD "THE ADVENTURER" and RUN. ☐

SEE PROGRAM LISTING ON PAGE 125

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COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to: *Commodares*, c/o *Ahoy!*, P.O. Box 723, Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #38-1: PARM PASS

This problem was submitted by Steven Steckler (Columbia, MD). Write two programs. The first program assigns a value from 0 to 65535 to a numeric variable, then loads and runs a second program. The second program obtains this parameter passed from the first program and prints its value.

PROBLEM #38-2: CRAFTY COMPARISON

We dare you to solve this one from Carmen Artino (Guilderland, NY). Without using conditional or Boolean statements (IF, <, OR, >, and so forth), assign to M the largest of the values of X entered in the following program:

```
10 FOR J=0 TO 3 : INPUT X
20 ... (your solution here)
...
90 NEXT J
99 PRINT M "IS THE LARGEST VALUE ENTERED"
```

PROBLEM #38-3: ALPHA SPRITE

Based on a suggestion from Jim Speers (Niles, MI), display any user-entered alphanumeric character in the upper left corner of the screen. Define a sprite by "capturing" this character. That is, the sprite should be the same size and composed of the same lit pixels as the original character. Then expand the sprite to be twice as wide and twice as tall as the original character. This should be easy on the 128 and a good workout on the 64.

PROBLEM #38-4: MAXIMUM SQUARE

Write a program to arrange the numbers 1 through 9 in a three-by-three square so that the sum of the "row-products" is a maximum. A row-product is the result of multiplying the three numbers in a row. For example, in this square:

```
1 4 7
2 5 8
3 6 9
```

the row-products are 28, 80, and 162, and the sum of the row-products is 270. There are only 362,880 possible arrangements of 9 numbers (9 factorial). Is this the best one?

This month we will discuss some of the best solutions to the October 1986 *Commodares*. The readers of this column just won't let me do anything wrong. *Problem #34-1: Distance Finder* was suggested by a related problem from Yuk Hung Mak (Curacao, Netherland Antilles). My example in the description of the problem was misleading (or downright wrong if you are less forgiving). Here is the story.

The problem was for the user to enter the width and height of a rectangular grid as well as two points A and B in the grid. The computer calculates the straight-line distance between the two points. If the width and height are 320 and 200 respectively (as with the high resolution graphics screen), cells 1 through 320 are across the top row. Cells 321 through 640 are across the second, and so forth, with cells 63681 through 64000 across the bottom row.

So far, so good. Then I stated that the distance from point 1 to point 320 should be 320, and that's where the trouble began. Any fool knows that the distance from point 1 to point 320 in a straight line is not 320, but 319. That must be obvious because the distance from point 1 to point 2 is 1, not 2.

But I won't give in without a fight, or at least a few words in my defense. Consider this. How wide is the graphics screen? You say it is 320 units wide, and I agree. In some sense, then, the distance from cell 1 at the left edge to cell 320 at the right edge of the screen is 320 units.

My thanks go to Curt Leiker of Wamego, KS (not far from my old stomping grounds in Salina) for his thorough analysis of this dilemma. In a nutshell, consider cell number 1 consisting of a square with corner coordinates (0,0), (1,0), (1,1), and (0,1), clockwise from the upper left corner. Cell number 2 is a square with corners at (1,0), (2,0), (2,1), and (1,1).

We usually associate cell 1 with the center of the cell.

As Curt points out, if each cell were a 1 mile by 1 mile square, it makes a difference if you are traveling from point (0,0) in cell 1 to cell 2 or from point (1,0) in cell 1 to cell 2. In fact the distance from cell 1 to cell 2 ranges from 0 (step across the boundary separating them) up to the square root of 5 or roughly 2.24 (go from the upper left corner of cell 1 to the lower right corner of cell 2).

So if you assume the cells have dimensions, then the distance from cell 1 to cell 320 could be 320. (If you assume the cells don't have dimensions, then how can the width of 320 dimensionless cells equal 320?)

Enough said. If we assume that the distance from cell 1 to cell 320 is 319 units, the problem is well-defined (and the way it was intended to be). The tidiest solution is this one from Craig Ewert (Crystal Lake, IL).

```
•1 REM COMMODARES PROBLEM #34-1:
•2 REM    DISTANCE FINDER
•3 REM SOLUTION BY
•4 REM    CRAIG EWERT
•5 REM
•10 INPUT"ENTER WIDTH & HEIGHT";W,H : HN=
 W*H
•20 INPUT"ENTER POINT NUMBERS";A,B
•30 IF A<0 OR A>HN OR B<0 OR B>HN THEN PR
 INT"ERROR IN NUMBERS" : GOTO 20
•40 X1=INT((A-1)/W) : Y1=A-W*X1
•50 X2=INT((B-1)/W) : Y2=B-W*X2
•60 DT=SQR((X2-X1)[UPARROW]2 + (Y2-Y1)[UP
 ARROW]2)
•70 PRINT"DISTANCE =";DT
```

Craig's program gets the dimensions of the grid and calculates the total number of cells in line 10. The two points are requested in line 20. Line 30 makes sure the points are both valid. Line 40 and 50 calculate the horizontal and vertical (X and Y) coordinates of the two points. You should calculate examples to see how these formulas work. The Pythagorean Theorem is applied to line 60 to find the distance between the two points.

The most unique solution is from Richard Bain (Madison, WI) written in COMAL 2.0 using Super Chip:

```
0001 // commodares problem #34-1
0002 //      distance finder
0003 // (comal 2.0 with superchip)
0004 //    by richard bain
0005 //
0010 input"type height & width: ";h,w
0020 input"first & last point: ";a,b
0030 print"h=";h;"w=";w;"a=";a;"b=";b
0040 use math
0050 print"distance=";distance((a-1) mod
w,(a-1) div w,(b-1) mod w,(b-1) div w)
```

The essence of Richard's program is line 50 which nimbly applies the Super Chip distance function. DIV and MOD are integer quotient and integer remainder functions: since 5 divided by 3 equals 1 with a remainder of 2, 5 DIV 3 is 1, and 5 MOD 3 is 2.

You can see that the expressions in Richard's formula are equivalent to those in Craig's program. The DISTANCE function performs the calculation of the Pythagorean Theorem. Richard is the programmer for the math package for Super Chip, so when he says the distance between points 1 and 64000 is 375.981383, we believe it.

Problem #34-2: Greased Igpay from Dr. Petrie Curryfavor (AKA Eddie Johnson—Albuquerque, NM) brought numerous responses to Dr. Curryfavor's "shortest Pig Latin translator program" challenge. There are numerous dialects of Pig Latin. Words starting with a vowel are simply repeated with either an "ay," "way," "hay," or "yay" added to the end. "Ant" becomes "antay," "antway," "anthay," or "antyay," depending upon in which part of the Roman barnyard you were raised.

There is also a difference of opinion as to whether "think" should become "hinktay" or "inkthay." I prefer the latter. Since Pig Latin is generally a spoken language, it should be translatable by sound rather than by spelling. For example, "through" which is pronounced "thru" should become "uthray," not something unspeakable such as "hroughtay."

Anywayway erehay are some solutions.

```
•1 REM PROBLEM #34-2 :
•2 REM       GREASED IGPAY
•4 REM =================================
•5 REM  - SOLUTION BY DR. CURRYFAVOR -
•6 REM =================================
•10 INPUTA$:V$="AEIOU"
•20 FORV=1TO5:IFLEFT$(A$,1)=MID$(V$,V,1)T
 HENPRINTA$"AY":GOTO10
•30 NEXT:A$=RIGHT$(A$,LEN(A$)-1)+LEFT$(A$
 ,1):GOTO20
•40 REM   NEXT:A$=MID$(A$,2)+LEFT$(A$,1):
 GOTO20
•94 REM =================================
•95 REM   - SOLUTION BY CHRIS BARTH -
•96 REM =================================
•100 GETA$:IF A$=" "THENPRINTW$"AY":RUN10
 0
•110 FORV=1TO5:A=A+(A$=MID$("AEIOU",V,1))
 :NEXT:IFA<0THENPRINTA$;:GOTO100
•120 W$=W$+A$:GOTO100
•194 REM ================================
•195 REM   - SOLUTION BY GREG SMISEK -
•196 REM ================================
•200 INPUTW$:FORC=1TOLEN(W$):FORL=1TO6+(C
 =1):IFMID$(W$,C,1)<>MID$("AEIOUY",L,1)TH
 ENNEXT:NEXT
•210 C=C+(C=3ANDMID$(W$,2,1)="H"):PRINTMI
 D$(W$,C)LEFT$(W$,C-1)CHR$(-87*(C=1))"AY"
 :RUN200
```

The first (lines 10 through 20) is from Dr. Curryfavor himself. The FOR-NEXT loop cycles through the input

word, each time taking the first letter and moving it to the end. This process continues until a vowel is found, at which time an "ay" is added to the end of the rotated word. This program works fine with normal words, but don't try entering "words" without a vowel such as "GRR" or "L". I respectively submit line 40 as an even shorter alternative to line 30. The MID$(A$,2) statement is identical in function to RIGHT$(A$,LEN(A$)−1).

The second solution is from Chris Barth (Clinton, NJ). Chris's program requires you to type a word and press the space bar when you are done. The screen starts displaying letters only after you have typed the first vowel in your word. When the space bar is pressed, the leading consonants (accumulated in W$) are printed followed by "ay."

Jim Speers (Niles, MI) and Greg Smisek (Lonsdale, MN) both sent two-line solutions. Jim's is for the C-128 and uses 140 characters in one line. Greg's solution is shown above starting at line 200. Greg arbitrarily decided that "single consonants, clusters of three consonants, and digraphs, except those with the letter 'H' in the second place," should all be moved to the end. He said that the "H" exception allows proper translation of "THE" which becomes "HETAY". At least Greg's solution handles "CYCLE" properly, which most others do not.

To try each of the three solutions above, type "RUN", "RUN100", or "RUN200".

At least half of the solutions to *Problem #34-3: Digit Decomposition* used string values other than the allowed "+" and "=". The most common violation was the "[LEFT]" character to erase the final plus sign. The problem was to input a positive integer up to nine digits long and to print out the individual digits and their sum separated by appropriate +'s and an equals sign. The catch was that no strings or string functions other than "+" and "=" were allowed.

This solution from Donald Pellegrini (Arroyo Grande, CA) meets the requirements:

```
·1 REM COMMODARES PROBLEM #34-3:
·2 REM    DIGIT DECOMPOSITION
·3 REM SOLUTION BY
·4 REM   DONALD PELLEGRINI
·5 REM
·10 SUM=0 : B=1E8 : FLG=0
·20 INPUT N:IF N>999999999 OR N<0 OR N-IN
 T(N)>0 THEN 20
·30 IF N<10 THEN PRINT N;"=";N : GOTO 10
·40 FOR J=1 TO 9
·50 C=INT(N/B) : IF C>0 THEN FLG=1
·60 IF FLG=1 THEN PRINT C;:SUM=SUM+C:IF J
 <9 THEN PRINT"+";
·70 N=N-C*B : B=B/10
·80 NEXT : PRINT"=";SUM : GOTO 10
```

Line 20 checks that the input value is within the proper limits and that the quantity is in fact an integer. Line 30 is required only for an input of 0. Prove this for yourself by removing it. The main loop at 40 repeatedly divides the input N by B, which starts at 1E8, until a value greater than 1 is found. The flag FLG is set to one once this value is found. This flag is used to eliminate any leading zeros for inputs less than 9 digits long.

Line 60 prints each digit, increments the SUM, and prints a plus sign after each digit except the last. Line 70 removes the most significant digit of the number and reduces the divisor B by a factor of ten. Then the process is repeated. After a maximum of nine digits have been processed, the equals sign and the SUM are printed.

Here is a solution for the C-128 from Wallace Leeker (Lemay, MO):

```
·1 REM COMMODARES PROBLEM #34-3
·2 REM   DIGIT DECOMPOSITION
·3 REM SOLUTION BY
·4 REM   WALLACE LEEKER
·5 REM
·10 INPUT "NUMBER";X :IF X>1E10 THEN 10
·20 FOR A=1 TO 9 : Y=INT(X/10)
·30 N(A)=X-(Y*10) : SU=SU+N(A) : X=Y
·40 NEXT A : B=10
·50 OPEN : B=B-1 : CLOSE OR N(B)>0
·55 IF B=1 THEN 80
·60 OPEN : PRINT N(B)"+"; : B=B-1
·70 CLOSE OR B=1
```

```
•80 PRINT N(1)"=";SU
```

Wallace stores all the digits in the N( ) array before printing them. Line 50 loops through the elements of the array until it finds the first non-zero value. If there is only one digit, the program branches to line 80 where it and the sum are printed. Otherwise the remaining digits are printed, separated by "+", and line 80 is executed. Notice that one of these two programs works from least significant digit to most significant digit, and the other program does just the opposite. Can you tell which is which?

James Killman (Memphis, TN) took the "no strings" limitation seriously. His program contained absolutely no strings. To input the "+"'s and "=", he used these statements on the C-64:

```
POKE 780,43 : SYS 65490
POKE 780,61 : SYS 65490
```

Location 780 is the A register storage area for the SYS command. SYS 65490 calls the CHROUT Kernal routine, which prints the character whose ASCII value is in the A register. CHROUT updates the cursor as well. The first line puts the ASCII value for "+" into the A register and prints it at the current cursor location. The second line does the same for the "=".

C-128 users do not use location 780. Instead, the second parameter of the SYS command is for the A register value, so the two lines on the C-128 are simply:

```
SYS 65490,43
SYS 65490,61
```

Very clever idea, James.

Greg Smisek (Lonsdale, MN) used the LOG function to determine the number of digits in the input number. The number of digits in any positive integer N is

```
1 + INT(LOG(N)/LOG(10))
```

This expression takes the integer part of the base-10 logarithm of N and adds 1 to it. The quotient of the two logs is necessary to convert the natural logarithm provided by BASIC into a base-10 logarithm.

Problem #34-4: Six Couples was an interesting challenge from Necah Buyukdura (Ankara, Turkey). Given six couples with each person identified by first initial, the following conditions apply:

C, F, P, Q and T are YOUNGER;
A, D, E, F, and Q are TALLER;
D, P, Q, S, and T are DARKER;
and A, C, P, S, and U are SLIMMER than their spouses (with B and R not mentioned). Who belongs with whom?

You might start with the assumption that there are no "equal" people in any couple except B and R. This means that in each couple, all four traits are exhibited. An easy way to test this assumption is presented in the following program based upon the solution from Bill Hoyt (Battle Creek, MI):

```
•1 REM COMMODARES PROBLEM #34-4:
•2 REM     SIX COUPLES
•3 REM SOLUTION BY
•4 REM     BILL HOYT
•5 REM
•10 DIM SP$(2,12),T(12)
•20 DATA A,TS,B,,C,YS,D,TD,E,T,F,YT,P,YDS
 ,Q,YTD,R,,S,DS,T,YD,U,S
•30 A$="YTDS"
•40 FOR N=1 TO 12 : READ SP$(1,N),SP$(2,N
 ) : NEXT N
•50 FOR N=1 TO 4 : CT=CT+ASC(MID$(A$,N,1)
 ) : NEXT
•60 FOR X=1 TO 12 : VX=0
•70 LX=LEN(SP$(2,X)) : IF LX=0 THEN 90
•80 FOR N=1 TO LX : VX=VX+ASC(MID$(SP$(2,
 X),N,1)) : NEXT N
•90 T(X)=VX : NEXT X
•100 FOR X=1 TO 11 : FOR Y=X+1 TO 12
•110 IF T(X)+T(Y)<>CT THEN 140
•120 PRINT SP$(1,X)" & "SP$(1,Y)
•130 SP$(0,X)="*" : SP$(0,Y)="*"
•140 NEXT Y : NEXT X
```

```
•150 FOR N=1 TO 12 : IF SP$(0,N)<>"*" THE
 N PRINT SP$(1,N)" UNMATCHED "SP$(2,N)
•160 NEXT N
```

Bill's idea is to add the ASCII values of the traits of each possible pair of people. If the total equals the sum of the ASCII values of the four traits "YTDS", then the two people represent a "complete set" of traits with no overlaps, and are therefore a valid couple. It turns out that five couples can be formed, each with a complete set of traits. That leaves B and R unmatched, which can therefore be matched since they have no conflicting traits.

Line 20 contains each person's initial followed by his traits. A$ stores all traits. Each person's initial is stored as an element of SP$(1,X) and the corresponding traits are stored in SP$(2,X), where X is a number from 1 to 12. Line 40 fills SP$. Line 50 sums the ASCII values of the four traits.

The loop from line 60 to line 90 adds the ASCII values of the traits of each person and stores the results in T(X). Take the sixth person F, for example, with traits Y and T. The associated array elements are

```
SP$(1,6) = "F"
SP$(2,6) = "YT"
T(6) = 173
```

The value of T(6) is the sum of the ASCII values of "Y" and "T" which are 89 and 84.

The main part of the program is the loop from line 100 to line 140. The sum of the T( ) values for each possible pair is calculated and compared with CT which is the ASCII count of all traits. If the pair's sum equals CT, then they combine all traits with no conflicts and are printed in line 120. When a match is found, an asterisk is stored in SP$(0,n) where n is the current value of X and of Y. The asterisk indicates which people have been paired up.

The final loop at line 150 searches all SP$(0,n) elements and lists those which do not contain an asterisk. You could add more logic to conclude that since B and R are unmatched, and since they have no traits, then they could be matched.

A different and more general approach to this problem would look for conflicts and eliminate any pairs with overlapping traits. For example, take each one of D's traits and see if it is among A's traits. If so, A and D cannot be paired. Since A and B have no overlapping traits, they could be paired. David Hoffner (Brooklyn, NY) randomly picked pairs, looked for conflicts, and printed the pair if no conflicts were found.

By the way, the couples forming a complete set of traits are A & T, C & D, E & P, F & S, and Q & U. There are many solutions, since B and R could be paired with either person in each of those couples instead, giving A & B and T & R for example.

This looks like the type of program that artificial intelligence languages such as LISP or PROLOG are famous for solving. If you have worked with such languages, give this problem a try, and send your results (thoroughly documented please).

Special mention to the others who sent solutions to this tough *Commodare:* Joseph Wright (Louisville, KY), Howard Reiser (Joliet, IL), Paul Sobolik (Pittsburgh, PA), Wallace Leeker (Lemay, MO), Greg Smisek (Lonsdale, MN)—an interesting, recursive COMAL program, and Jim Speers (Niles, MI).

William Ballance (Jacksonville, NC) said that he would welcome any new faces to Mr. Wizard's Software Works (a free bulletin board system). If you have a modem, you might do well to check in at 1-919-353-7575. Continue to keep those challenges and solutions coming. See you next month.

Other readers with solutions not already mentioned this month include:

Robert Arnold (Wrightsville, PA)
Chris Barbieri (Selden, NY)
Mark Boettcher (Plymouth, MA)
Leo Brenneman (Erie, PA)
Dave Budgett (Graceville, MN)
Marcus Cooper, Jr. (Macon, GA)
Thomson Fung (San Diego, CA)
Harold Garter (Phoenix, AZ)
Doug Jewell (Burnaby, BC)
Sol Katz (Lakewood, CO)
Doug Klein (Albany, NY)
W.J. McMahon (Agawam, MA)
Karen Middaugh (San Diego, CA)
Jamie Morrison (Bend, OR)
Kevin Nauss (Seattle, WA)
Edward O. Nichols (Lawton, OK)
Bill O'Rourke (Crystal River, FL)
Norman Richards (Angleton, TX)
Sixto Santos (Bayamon, PR)
Steve Smith (Glendale, AZ)
Steven Steckler (Columbia, MD)
M.B. Watson (Denham Springs, LA)
Willie Williams (Augusta, GA)
Robert Willis (Eden, NC)

MORE BASIC 128

By Shawn K. Smith

Since purchasing my first computer three years ago, I've learned and tutored several computer languages and can safely say that no language contains every command a programmer could ever ask for, not even BASIC 7.0 on the 128. In fact, *More BASIC 128* adds five (or is it six?) new commands to the 128 that I think should have been made a standard part of the 128's vocabulary: .VHELP, .DLIST, .DREAD, .SEND, .DABS, and .USTOP.

.VHELP displays the current values of all non-array variables in a program. This feature is a must for viewing the value of strings that contain special control characters such as ESC and INSTant DELete. Placing this command at strategic points within a program can help in debugging.

.DLIST displays the content of a BASIC program from disk to the screen without disrupting the program currently in memory. Example: .DLIST"MENU".

.DREAD displays the content of a sequential file from disk to the screen without disrupting the program currently in memory. Example: .DREAD"DOCUMENT .SEQ".

.SEND provides a quick way of sending commands to the disk operating system (DOS). Examples: .SEND "S0:filename" scratches a file, .SEND"R0:newname= oldname" renames a file, .SEND"V0" validates the disk, and .SEND"N0:diskname,id" news (formats) a disk. Refer to your disk drive user's manual for a list of DOS commands.

.DABS displays the starting address of a file. Since most binary files are executed with a SYS to the starting address, this command can be an aid if you forget the SYS number. For instance, .DABS"MORE BASIC.ML" will display the number 5959 which is the starting address and SYS necessary to engage *More BASIC 128.*

.USTOP disables *More BASIC 128.* You will probably never need to disable this utility, but it's there if you need it. Once again, SYS5959 will reenable it.

More BASIC 128 will function in direct or program mode, and string variables may be used with the commands (e.g.: .DLIST F$). To terminate a command, momentarily press the CONTROL key. This utility can also be used to merge programs from disk with the program currently in memory. Since .DLIST and .DREAD displays the disk file to the screen, you can have the desired file displayed, and when the lines you want merged with the program in memory are on the screen, press the CONTROL key to stop the listing, cursor up to the lines, and press RETURN over them.

More BASIC 128 consists of two programs. The first listing on page 120, *Booter & Menu,* should be typed in and saved before entering the second listing. This part gives you a quick reminder of the commands, loads the ML file created by the second listing, *Creator,* and activates the utility. *Creator* is a BASIC loader that is used to create a pure ML file on disk by the name of "MORE BASIC.ML." Be sure to save the program and to have a disk in the drive before running it.

To load and activate the utility, enter: RUN"MORE BASIC 128." Once you've familiarized yourself with the commands, the utility can be loaded without using *Booter & Menu* or disrupting the program in memory by entering BLOAD"MORE BASIC.ML": SYS5959.

More BASIC 128 is stored in RAM from 5959-6495 ($1796-$195F); therefore, no other data should be stored in this area. The utility also uses the RS-232 input buffer ($C00-$CFF) for the .DLIST command. *More BASIC 128* works by wedging into the IERROR vector ($300-$301).

I am sure that after you have used *More BASIC 128* a few times you will agree that these commands should have been made a standard part of BASIC 7.0. You will probably come up with other commands that you'll like to see added to the 128. □

SEE PROGRAM LISTING ON PAGE 120

Continued from page 36

If the Y-register is zero, the routine jumps to the RTS at address $133B which is the end of the program. If Y is not zero, then these instructions starting at $1332 are performed:

```
JSR $FFD2
DEX
BNE $1332
DEY
BNE $1332
```

These are equivalent to nested FOR-NEXT loops ıı

```
FOR Y= ? TO ? STEP -1
FOR X= 255 TO 0 STEP -1
gosub $FFD2
NEXT X
NEXT Y
```

The X-register is decremented from its maximum value (255) to zero, then the Y-register is decremented. Again X cycles from 255 to 0, and Y is decremented. This continues until Y becomes zero. Then the final BNE instruction at $1339 is skipped, and the final RTS instruction is reached which returns to the calling BASIC program.

KERNAL ROUTINES

The subroutine at $FFD2 is a Kernal routine called CHROUT or BSOUT. Look in your *PRG* for a description of this routine. In this program, CHROUT takes the value of the character in the A register (also called the accumulator) and displays it on the screen at the next available location. Consequently CHROUT does the dirty work of updating the cursor location and determining the proper screen address to put the character.

Recall that our BASIC calling program loaded the A-register with the value of the character to be printed. It also loaded the X and Y registers with the count of characters to be printed. We saw that the STRING utility called $FFD2 X times initially, and then it performed the nested X-Y loop Y times. Each execution of the nested X-Y loop called $FFD2 256 times as X was decremented from 255 to 0. Consequently the STRING utility prints the specified character (X + 256*Y) times, just as desired.

Familiarity with the Kernal routines will usually help with the disassembly of other programs as well. Kernal routines are frequently used since they provide a handy way to perform very tedious machine language chores. The *PRG's* give complete descriptions and examples for the Kernal routines.

We still haven't discussed the data characters we saw between addresses $131F and $1323. To interpret them, type M 131F 1323. They happen to be the name of the best magazine for Commodore computers, as you can

```
. 0131C  4C 24 13 JMP $1324
. 0131F  41 48    EOR ($48,X)
. 01321  4F       ???
. 01322  59 21 E0 EOR $E021,Y
D1324,133B
. 01324  E0 00    CPX #$00
. 01326  F0 06    BEQ $132E
. 01328  20 D2 FF JSR $FFD2
. 0132B  CA       DEX
. 0132C  D0 FA    BNE $1328
. 0132E  C0 00    CPY #$00
. 01330  F0 09    BEQ $133B
. 01332  20 D2 FF JSR $FFD2
. 01335  CA       DEX
. 01336  D0 FA    BNE $1332
. 01338  88       DEY
. 01339  D0 F7    BNE $1332
. 0133B  60       RTS
M131C,133B
>0131C 4C 24 13 41 48 4F 59 21:...AHOY!
>01324 E0 00 F0 06 20 D2 FF CA:........
>0132C D0 FA C0 00 F0 09 20 D2:........
>01334 FF CA D0 FA 88 D0 F7 60:........

   *** SCREEN DUMP 1  ***
```

see in *Screen Dump 1.* (If your C-64 monitor does not give an ASCII display, you must translate the data bytes

yourself.) These data bytes are not used by the STRING program, although many machine language utilities are organized this way. It is common practice to set aside a data storage area at the beginning of a program with a JMP instruction to bypass the data.

RELOCATION

The JMP instruction and the five data bytes are not necessary for the STRING program. They are there simply to illustrate an important consideration in modifying or moving any machine language routine. Before we can move any machine language program, we must determine whether or not it is relocatable. If it is not relocatable, we must modify it before it will work.

The JMP statement is one byte ($4C) followed by a two-byte address. If you look at the hexadecimal bytes for the BEQ and BNE (branch) instructions, you will see that they are each two-byte instructions. The second byte in a branch is an offset, not an address. For example, the first BEQ instruction at address $1326 appears as:

```
01326    F0 06    BEQ $132E
```

The disassembler knows that $F0 is a BEQ instruction. The $06 is added to the current memory address (which is now $1328 since the address is updated before the instruction is executed) giving $132E.

Compare that with the JMP instruction at $131C:

```
0131C   4C 24 13   JMP $1324
```

The $4C means JMP. The $24 $13 is the actual address $1324 in "low byte-high byte" format.

Suppose you loaded this program into memory at some address other than $131C, say $C000. When you tell the computer to execute this program at $C000, the first instruction of the program causes the computer to jump to address $1324. There is no telling what might reside at $1324 if your program resides at $C000. Chances are that the computer will get lost in some meaningless code, requiring you to restart the computer.

On the other hand, suppose the program is moved so that the BEQ instruction described above resides at address $2000. The BEQ instruction still works fine. Why? Because the two bytes of the instruction, $F0 $06 provide a *relative,* not a *fixed,* branching address.

When the computer reaches address $2000, it sees the $F0 and knows to treat the next byte as a quantity to be added to the next instruction address. The next instruction address is $2002 (since the BEQ instruction is in $2000 and $2001). The processor adds $06 to $2002 and branches (if the zero flag is set) to the instruction at address $2008. The BEQ, BNE, and all other branch instructions use *relative* addressing, and work fine wherever the program resides in memory.

If you want to move a program and run it from a different place in memory, you must "fix up" any instructions which use *absolute* addresses. JMP and JSR (jump to subroutine) are two examples. If the absolute address is at some fixed location outside of the program (such as $FFD2 in our example), it should not be changed. If the absolute address is to some location within the program which is being moved (such as JMP $1324 in our example), then the address must be corrected.

C-64 users could relocate this program to start at address $C000 (49152). Since $1324 is the ninth byte in the original program, the JMP should still go to the ninth byte in the moved program which is now $C008. C-64 users should change the JMP $1324 instruction to JMP $C008. To do this, the second and third DATA items in *String Loader* should be changed to 08 C0 (remember that address bytes are stored in reverse order).

The BEQ and BNE are called "relocatable" instructions since they can be moved without being fixed up. A program is called "relocatable" if it contains only relative branching or branches only to fixed addresses, and if it does not directly address data. Indirect addressing of data is a topic for future discussion.

To make the STRING program relocatable, we could simply eliminate the first eight bytes. (They are there only for illustration anyway.) Other programs may or may not be easily relocated. You must analyze all jump instructions as well as instructions which load, store, or operate on memory values. Generally those addresses must be changed when the program is moved.

The *Flashy Windows* program for the C-128 (see page 114) shows one way to use the STRING routine. You must run *String Loader* to put the machine language program into memory before running *Flashy Windows.*

C-64 users should modify *String Loader* as described above to relocate the program to address 49152 ($C000). The steps are

1. Change line 1000 to M=49152.
2. Change line 1030 to GOSUB 2050.
3. Change the second and third data bytes from 24,13 to 08,C0 and change the checksum in 1080 to 4526.

Use the program *Screen Flash* on page 114 as an example for calling the STRING program on the C-64. Again *String Loader* must be run before *Screen Flash* will work.

The procedure we have followed is typical of breaking into and relocating any machine language utility. If STRING interferes with some of your other resident utilities, you now know how to modify it (or them) to reside wherever you want. Make your computer work the way you want it to work. That is the true spirit of hacking. ☐

SEE PROGRAM LISTINGS ON PAGE 114

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑CRSR↓	
[DOWN]	Cursor Down	↑CRSR↓	
[LEFT]	Cursor Left	SHIFT ←CRSR→	
[RIGHT]	Cursor Right	←CRSR→	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	
[BACKARROW]	Back Arrow	←	
[PI]	PI	π	
[EP]	English Pound	£	

When You See	It Means	You Type	You Will See
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent*. (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y      AB
·110 IF Y<0 OR Y>255 THEN 130                EA
·120 POKE X,Y:NEXT:GOTO140                   ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
-500":END                                    HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
KE646,1                                      NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
TALLED[6" "]"                                LF
·170 DATA32,161,192,165,43,133,251,165,44,133 DL
·180 DATA252,160,0,132,254,32,37,193,234,177 DB
·190 DATA251,208,3,76,138,192,230,251,208,2  OF
·200 DATA230,252,76,43,192,76,73,78,69,32    KN
·210 DATA35,32,0,169,35,160,192,32,30,171    CA
·220 DATA160,0,177,251,170,230,251,208,2,230 CE
·230 DATA252,177,251,32,205,189,169,58,32,210 JE
·240 DATA255,169,0,133,253,230,254,32,37,193 CL
·250 DATA234,165,253,160,0,76,13,193,133,253 NB
·260 DATA177,251,208,237,165,253,41,240,74,74 MB
·270 DATA74,74,24,105,65,32,210,255,165,253  EP
·280 DATA 41,15,24,105,65,32,210,255,169,13  GH
·290 DATA32,220,192,230,63,208,2,230,64,230  AN
·300 DATA251,208,2,230,252,76,11,192,169,153 NG
·310 DATA160,192,32,30,171,166,63,165,64,76  BF
·320 DATA231,192,96,76,73,78,69,83,58,32     EP
·330 DATA0,169,247,160,192,32,30,171,169,3   PJ
·340 DATA133,254,32,228,255,201,83,240,6,201 FK
·350 DATA80,208,245,230,254,32,210,255,169,4 FL
·360 DATA166,254,160,255,32,186,255,169,0,133 CL
·370 DATA63,133,64,133,2,32,189,255,32,192   GC
·380 DATA255,166,254,32,201,255,76,73,193,96 NN
·390 DATA32,210,255,173,141,2,41,1,208,249   NH
·400 DATA96,32,205,189,169,13,32,210,255,32  IM
·410 DATA204,255,169,4,76,195,255,147,83,67  KC
·420 DATA82,69,69,78,32,79,82,32,80,82       DC
·430 DATA 73,78,84,69,82,32,63,32,0,76       ML
·440 DATA44,193,234,177,251,201,32,240,6,138 GN
·450 DATA113,251,69,254,170,138,76,88,192,0  JK
·460 DATA0,0,0,230,251,208,2,230,252,96      NA
·470 DATA170,177,251,201,34,208,6,165,2,73   DM
·480 DATA255,133,2,165,2,208,218,177,251,201 JA
·490 DATA32,208,212,198,254,76,29,193,0,169  FM
·500 DATA13,76,210,255,0,0,0                 PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
:S=S+Y:TRAP110:NEXT:SLOW                     IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
**ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
S 140-390":END                               JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
INSTALLED"                                   II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"  IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
252,160,0,132,254,32,37                      OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
51,208,2,230,252,76,43                       NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
,12,32,80,13,160,0,177                       OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
1,32,89,13,169,58,32,98                      EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
4,165,253,160,0,76,13                        JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
1,240,74,74,74,74,24                         LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
,65,32,98,13,169,13,32                       DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
08,2,230,252,76,11,12                        GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
6,76,231,12,96,76,73,78                      CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
3,169,3,133,254,32,107                       HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
54,32,98,13,169,4,166                        GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
33,66,133,250,32,125,13                      LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
,96,32,98,13,165,211                         JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
32,98,13,32,152,13,169,4                     GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
9,82,32,80,82,73,78,84,69                    PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
01,32,240,6,138,113,251,69                   OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
,208,2,230,252,96,170,177                    FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
250,165,250,208,218,177                      GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
0,169,13,76,98,13,0,0,32                     FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
,32,50,142,76,180,13,32                      OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
3,32,228,255,76,180,13,32                    AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
3,32,189,255                                 BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
0,13,32,170,13                               FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
4,255,76,180,13,32,170                       ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
,141,0,255,165,67,96                         BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
,0                                           IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.
f3 – LOADs in a program worked on previously.
f5 – To continue on a line you stopped on after LOADing in the previous saved work.
f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                                    LL
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";          ED
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                               MC
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"             DM
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
 [3" "]"                                                          DH
·125 FORA=54272TO54296:POKEA,0:NEXT                               IM
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                       NH
·135 FORA=680TO699:READB:POKEA,B:NEXT                             KO
·140 DATA169,251,166,253,164,254,32,216,255,96                    HJ
·145 DATA169,0,166,251,164,252,32,213,255,96                      JB
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B              KA
·155 GOSUB480:IFB=0THEN150                                        GN
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16                    KE
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B                     LO
·170 GOSUB470:IFB=0THEN150                                        EE
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                        MN
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                       GE
·185 POKE253,B:PRINT                                              HN
·190 REM  GET HEX LINE                                            IL
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8                     NH
·200 FORB=0TO1:GOTO250                                            MP
·205 NEXTB                                                        ME
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                        LE
·215 PRINT" [c P][LEFT]";                                         IK
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                        PD
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                       LK
·230 NEXT                                                         IA
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                               LE
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195                BI
·245 REM    GET HEX INPUT                                         AB
·250 GETA$:IFA$=""THEN250                                         HK
·255 IFA$=CHR$(20)THEN305                                         HF
·260 IFA$=CHR$(133)THEN535                                        KH
·265 IFA$=CHR$(134)THEN560                                        JM
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                           EG
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                           AB
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295                 DL
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295                 MD
·290 GOSUB415:GOTO250                                             JJ
·295 PRINTA$"[c P][LEFT]";                                        OA
·300 GOTO205                                                      CF
·305 IFA>0THEN320                                                 PG
·310 A=-1:IFB=1THEN330                                            OI
·315 GOTO220                                                      BM
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                       HG
·325 A=A-1                                                        BE
·330 PRINTCHR$(20);:GOTO220                                       LK
·335 REM LAST LINE                                                AD
·340 PRINT" ":T=AD-(INT(AD/256)*256)                              GJ
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255                     PL
·350 NEXT                                                         IA
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                               NF
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                              HN
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                       JA
·370 REM BELL AND ERROR MESSAGES                                  FL
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415          DA
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415              FF
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                                HD
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                          OK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415               FN
·400 PRINT"?ERROR IN SAVE":GOTO415                                PP
·405 PRINT"?ERROR IN LOAD":GOTO415                                PO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                      PG
·415 POKE54276,17:POKE54276,16:RETURN                             BH
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN             IM
·425 REM GET FOUR DIGIT HEX                                       PC
·430 PRINT:PRINTB$;:INPUTT$                                       GM
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                             NP
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                      FJ
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN          GF
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN                  EH
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN                  KP
·460 T(A)=16:RETURN                                               NP
·465 REM ADRESS CHECK                                             LI
·470 IFAD>ENTHEN385                                               LB
·475 IFB<SRORB>ENTHEN390                                          KC
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395                 MG
·485 RETURN                                                       IM
·490 REM ADDRESS TO HEX                                           EB
·495 AC=AD:A=4096:GOSUB520                                        FD
·500 A=256:GOSUB520                                               PE
·505 A=16:GOSUB520                                                MI
·510 A=1:GOSUB520                                                 IL
·515 RETURN                                                       IM
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530                   PE
·525 A$=CHR$(T+48)                                                JP
·530 PRINTA$;:AC=AC-A*T:RETURN                                    AC
·535 A$="**SAVE**":GOSUB585                                       LH
·540 OPEN1,T,1,A$:SYS680:CLOSE1                                   LH
·545 IFST=0THENEND                                                EO
·550 GOSUB400:IFT=8THENGOSUB420                                   CM
·555 GOTO535                                                      CL
·560 A$="**LOAD**":GOSUB585                                       NE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                                   MF
·570 IFST=64THEN195                                               LC
·575 GOSUB405:IFT=8THENGOSUB420                                   AN
·580 GOTO560                                                      CL
·585 PRINT" ":PRINTTAB(14)A$                                      FG
·590 PRINT:A$="":INPUT"FILENAME";A$                               OM
·595 IFA$=""THEN590                                               DD
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                             DF
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN                 IG
·610 IFB$<>"T"THEN605                                             BO
·615 RETURN                                                       IM
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B                      OH
·625 GOSUB475:IFB=0THEN620                                        GH
·630 PRINT:GOTO195                                                PH
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B                     FA
·640 GOSUB475:IFB=0THEN635                                        IB
·645 PRINT:GOTO670                                                PP
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                                  NK
·655 PRINT" ";:NEXTB                                              EC
·660 PRINT:AD=AD+8                                                GN
·665 GETB$:IFB$=CHR$(136)THEN195                                  LI
·670 GOSUB495:PRINT": ";:GOTO650                                  IB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 99 and 100 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

CRUNCHMAN

FROM PAGE 29


```
·0 POKE53280,14:POKE53281,14:PRINT"[CLEAR
]"CHR$(142)"[10"[DOWN]"][BLUE][10"[RIGHT
]"]GAME IS BEING LOADED[DOWN]"                LJ
·1 PRINT"[4"[RIGHT]"][RED]* TAPE USERS DO
 NOT SWITCH OFF *"SPC(52)"[BLUE]UNTIL GA
ME  IS ON SCREEN                              IA
·2 POKE56334,PEEK(56334)AND254:POKE1,PEEK
(1)AND251                                     BE
·3 FORK=0TO2047:POKE12288+K,PEEK(53248+K)
:NEXT:POKE1,PEEK(1)OR4                        ME
·4 POKE56334,PEEK(56334)OR1:POKE53265,27:
FORK=0TO575:READZ:POKE15808+K,Z:NEXT          GF
·5 FORK=0TO7:READZ:POKE12632+K,Z:NEXT:FOR
K=0TO15:READZ:POKE12656+K,Z:NEXT              AF
·6 FORK=0TO39:READZ:POKE12808+K,Z:NEXT        AH
·7 POKE53272,(PEEK(53272)AND240)OR12:POKE
53270,PEEK(53270)OR16:FORK=0TO126             PE
·8 READZ:POKE8192+K,Z:NEXT:FORK=0TO9:READ
Z:POKE30975+K,Z:NEXT:POKE45,0                 KM
·9 POKE46,128:CLR:POKE5405,0:POKE5406,121
:POKE808,234:REM"[12"[DEL]"]5407,123          DP
·100 DATA7,224,0,31,248,0,63,252,0            KG
·101 DATA127,254,0,127,254,0,255,255,0        HD
·102 DATA255,255,0,255,255,0,255,255,0        OP
·103 DATA255,255,0,255,255,0,127,254,0        HM
·104 DATA127,254,0,63,252,0,31,248,0          MP
·105 DATA7,224,0,0,0,0,0,0,0                  PN
·106 DATA0,0,0,0,0,0,0,0,0                    NC
·107 DATA0,0,0,16,8,0,48,12,0                 GP
·108 DATA120,30,0,120,30,0,252,63,0           IA
·109 DATA252,63,0,254,127,0,254,127,0         EB
·110 DATA255,255,0,255,255,0,127,254,0        HM
·111 DATA127,254,0,63,252,0,31,248,0          MP
·112 DATA7,224,0,0,0,0,0,0,0                  PN
·113 DATA0,0,0,0,0,0,0,0,0                    NC
·114 DATA7,224,0,31,248,0,63,252,0            KG
·115 DATA127,254,0,127,248,0,255,224,0        HI
·116 DATA255,128,0,254,0,0,254,0,0            IA
·117 DATA255,128,0,255,224,0,127,248,0        KO
·118 DATA127,254,0,63,252,0,31,248,0          MP
·119 DATA7,224,0,0,0,0,0,0,0                  PN
·120 DATA0,0,0,0,0,0,0,0,0                    NC
·121 DATA7,224,0,31,248,0,63,252,0            KG
·122 DATA127,254,0,127,254,0,255,255,0        HD
·123 DATA255,255,0,254,127,0,254,127,0        GP
·124 DATA252,63,0,252,63,0,120,30,0           EI
·125 DATA120,30,0,48,12,0,16,8,0              FK
·126 DATA0,0,0,0,0,0,0,0,0                    JH
·127 DATA0,0,0,0,0,0,0,0,0                    NC
·128 DATA7,224,0,31,248,0,63,252,0            KG
·129 DATA127,254,0,31,254,0,7,255,0           FJ
·130 DATA1,255,0,0,127,0,0,127,0              GN
·131 DATA1,255,0,7,255,0,31,254,0             EG
·132 DATA127,254,0,63,252,0,31,248,0          MP
·133 DATA7,224,0,0,0,0,0,0,0                  PN
·134 DATA0,0,0,0,0,0,0,0,0                    NC
·135 DATA2,128,0,10,160,0,42,168,0            PN
·136 DATA170,170,0,158,182,0,158,182,0        LD
·137 DATA150,150,0,150,150,0,170,170,0        MD
·138 DATA170,170,0,170,170,0,170,170,0        IL
·139 DATA170,170,0,170,170,0,136,136,0        BH
·140 DATA136,136,0,0,0,0,0,0,0                OH
·141 DATA0,0,0,0,0,0,0,0,0                    NC
·142 DATA2,128,0,10,160,0,42,168,0            PN
·143 DATA170,170,0,150,150,0,158,158,0        ID
·144 DATA158,158,0,150,150,0,170,170,0        FD
·145 DATA170,170,0,170,170,0,170,170,0        IL
·146 DATA170,170,0,170,170,0,136,136,0        BH
·147 DATA136,136,0,0,0,0,0,0,0                OH
·148 DATA0,0,0,0,0,0,0,0,0                    NC
·149 DATA2,128,0,10,160,0,42,168,0            PN
·150 DATA170,170,0,150,150,0,150,150,0        PD
·151 DATA158,182,0,158,182,0,170,170,0        HH
·152 DATA170,170,0,170,170,0,170,170,0        IL
·153 DATA170,170,0,170,170,0,136,136,0        BH
·154 DATA136,136,0,0,0,0,0,0,0                OH
·155 DATA0,0,0,0,0,0,0,0,0                    NC
·156 DATA2,128,0,10,160,0,42,168,0            PN
·157 DATA170,170,0,150,150,0,182,182,0        GJ
·158 DATA182,182,0,150,150,0,170,170,0        HB
·159 DATA170,170,0,170,170,0,170,170,0        IL
·160 DATA170,170,0,170,170,0,136,136,0        BH
·161 DATA136,136,0,0,0,0,0,0,0                OH
·162 DATA0,0,0,0,0,0,0,0,0                    NC
·163 DATA0,126,126,126,126,126,126,0          OM
·164 DATA0,0,0,0,0,3,3,0,0,0,0,0,24,24,
0                                             BH
·165 DATA20,5,15,62,63,63,11,3                GD
·166 DATA20,68,240,252,236,252,176,192        GE
·167 DATA0,1,4,12,63,63,44,0                  GC
·168 DATA20,80,16,4,12,63,63,44               FM
·169 DATA60,126,248,240,240,248,126,60        BB
·170 DATA34,146,46,82,171,36,138,170,164      JD
·171 DATA138,186,100,137,42,36,248,0,0        OL
·172 DATA136,0,0,0,0,0,113,20,232             NJ
·173 DATA138,170,136,130,170,202,187,162,
138                                           OL
·174 DATA114,162,229,0,0,0,0,0,0              IM
·175 DATA0,0,0,0,0,0,0,0,0                    JH
·176 DATA0,0,0,0,0,0,0,0,0                    NC
·177 DATA56,156,231,69,82,148,65,82,150       GO
·178 DATA93,220,148,57,82,231,0,0,0           IF
·179 DATA0,0,0,0,0,34,147,156,70              NC
·180 DATA170,80,202,170,89,50,187,145,63      NJ
·181 DATA42,92,194,0,0,0,0,0,0                IC
```

```
•182 DATA0,0,0,0,0,0,0,0,0,0                JH
•183 DATA0,0,0,0,0,0,0,0,0,0                JH
•184 DATA0,7,121,0,128,147,0,0,0,0          LB
•185 LOAD"CRUNCHMAN2",8                     DN
```

CRUNCHMAN 2

```
•100 PRINT"[CLEAR]"CHR$(142)CHR$(8):POKE5
 3280,0:POKE53281,0                         HN
•101 POKE53272,(PEEK(53272)AND240)OR12:PO
 KE53265,27:POKE53270,PEEK(53270)OR16       BN
•102 A=14948:FORK=1TO8:FORK1=0TO255STEP16
 :A=A-1:POKEA,K1:NEXTK1                     OE
•103 FORK1=255TO0STEP-16:A=A-1:POKEA,K1:N
 EXTK1,K:POKE14692,0                        GN
•104 FORK=0TO255:POKE14336+K,INT(RND(1)*4
 )+1:NEXT                                   AC
•105 POKE53282,13:POKE53283,1:POKE53269,0   CJ
•106 PRINT"[CLEAR]";:FORI=1TO4:PRINT"[CYA
 N] CRUNCHMAN 64 [BLUE]CRUNCHMAN 64 [CYAN
 ]CRUNCHMAN 64 ";                           KP
•107 NEXT:PRINTSPC(14)"[DOWN][DOWN][PURPL
 E]ROY D. LEWIS[CYAN]                       OP
•108 PRINTSPC(11)"[DOWN][DOWN]JOYSTICK IN
  PORT 2                                    FP
•109 PRINTSPC(11)"[DOWN]2 POINTS  PER SPO
 T                                          OI
•110 PRINTSPC(4)"[DOWN][PURPLE]GHOSTS SCO
 RE :  30, 60, 120, 240                     NH
•111 PRINTSPC(4)"[DOWN][CYAN]BONUS POINTS
  :[3" "][c 3][s A][s B] [CYAN]100  [c 3]
 [s C][s D][CYAN]  250                      EI
•112 V=53248:POKEV+37,1:POKEV+38,0:POKEV+
 39,7:POKEV+40,2:POKEV+41,3:POKEV+42,4      HA
•113 POKEV+43,5:POKEV+28,30:POKEV+23,0:PO
 KEV+29,0:POKEV+27,0:POKEV+16,20            MF
•114 RESTORE:FORK=2TO9:READZ:POKEV+K,Z:NE
 XT:POKE2041,253:POKE2042,255               DG
•115 POKEV+10,135:POKEV+12,183:POKEV+11,2
 00:POKEV+13,200                            GC
•116 POKE2043,253:POKE2044,255:POKEV+21,1
 26:POKEV+23,96:POKEV+29,96                 PH
•117 POKE2045,128:POKE2046,129              IP
•118 PRINT"[DOWN][DOWN][PURPLE][4" "]GOOL
 Y"SPC(22)"GOOKY                            CB
•119 PRINT"[3"[DOWN]"][4" "]COOLY"SPC(22)
 "COOKY                                     AJ
•120 PRINT"[DOWN] [CYAN][10"+"][BLUE]PRES
 S THE SPACEBAR[CYAN][10"+"][HOME]":POKE1
 98,0                                       JE
•121 FORK=1TO4:P=V+(K*2)+1:B=PEEK(P):A=B:
 POKE2040+K,252:POKE53280,K+1               KP
•122 POKEV+44,K+1:POKEV+45,K+1              DI
•123 A=A-1:IFA=40THENA=250                  IF
•124 POKEP,A:IFA<>BTHEN123                  EN
•125 POKE2040+K,253+(2*ABS((K/2)=INT(K/2)
 ))                                         GK
•126 GETA$:IFA$<>""THEN128                  AB
•127 NEXTK:GOTO121                          BD
•128 POKE53280,0:HS$=STR$(HS):HS$=RIGHT$(
 HS$,LEN(HS$)-1)                            ND
•129 IFLEN(HS$)<5THENHS$="0"+HS$:GOTO129    BA
•130 PRINT"[CLEAR][BLUE] SCORE : [CYAN][5
 "0"] [BLUE]HIGH : [CYAN]"HS$" [YELLOW][s
  E][s E] [BLUE]LEV :                       MD
•131 POKE1001,20:POKE1002,40:POKE1007,3:L
 V=0:POKE1004,0:POKE1005,0                  PM
•132 A=3:NM=3:POKE908,0:POKE909,0           JH
•133 FORK=0TO14STEP7:POKE54276+K,0:NEXT:P
 OKE54272,0:POKE54273,0:POKE54277,0         IG
•134 POKE54278,240:POKE54276,33:POKE54279
 ,0:POKE54280,0:POKE54284,52                CI
•135 POKE54285,15:POKE54283,0:POKE54286,0
 :POKE54287,0:POKE54291,0                   LJ
•136 POKE54292,240:POKE54290,33:POKE54296
 ,10:FORK=910TO920:POKEK,0:NEXT             KO
•137 POKEV+21,0:IFNM>ATHENNM=A:GOTO165      HL
•138 LV=LV+1:PRINT"[HOME][CYAN]"TAB(36);L
 V:POKE908,0:POKE909,0                      OK
•139 LV$="  ":IFLV>1THENLV$="[s A][s B]":
 IFLV>3THENLV$="[s C][s D]"                 MK
•140 PRINT"[HOME][DOWN][BLUE][40"+"]";      GF
•141 PRINT"+[RED][s Q][WHITE][15"."][SS][
 BLUE]+[c 3]"LV$"[BLUE]+[WHITE][15"."][RE
 D][s Q][BLUE][SS]+";                       DL
•142 PRINT"+[WHITE].[5"[SS]"].[8"[SS]"].[
 SS][BLUE]+[SS][SS]+[WHITE].[8"[SS]"].[5"
 [SS]"].[SS][BLUE]+";                       JN
•143 PRINT"+[WHITE].[SS][BLUE][4"+"][WHIT
 E].[SS][BLUE][7"+"][WHITE].[SS][BLUE][4"
 +"][WHITE].[SS][BLUE][7"+"][WHITE].[SS][
 BLUE][4"+"][WHITE].[SS][BLUE]+";           GJ
•144 PRINT"+[WHITE].[SS][BLUE]+[WHITE][31
 "."][SS][BLUE]+[WHITE].[SS][BLUE]+";       FO
•145 PRINT"[BLUE]+[WHITE].[SS][BLUE]+[WHI
 TE].[11"[SS]"].[SS][SS].[SS][SS].[11"[SS
 ]"].[SS][BLUE]+[WHITE].[SS][BLUE]+";       PL
•146 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[S
 S][BLUE][10"+"][WHITE].[SS][BLUE]+[WHITE
 ].[SS][BLUE]+[WHITE].[SS][BLUE][10"+"][W
 HITE].[SS][BLUE]+[WHITE].[SS][BLUE]+";     MK
•147 PRINT"+[WHITE].[SS][BLUE]+[WHITE][4"
 ."][SS][BLUE]+[WHITE][7"."][SS][BLUE]+[W
 HITE].[SS][BLUE]+[WHITE][7"."][SS][BLUE]
 +[WHITE][4"."][SS][BLUE]+[WHITE].[SS][BL
 UE]+";                                     PG
•148 PRINT"[BLUE]+[WHITE].[SS][BLUE]+[WHI
 TE].[SS][SS].[SS][BLUE]+[WHITE].[7"[SS]"
 ][BLUE]+[WHITE].[SS][BLUE]+[WHITE][6"[SS
 ]"].[SS][BLUE]+[WHITE].[SS][SS].[SS][BLU
 E]+[WHITE].[SS][BLUE]+";                   JL
•149 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[S
 S][BLUE]+[WHITE].[SS][BLUE]+[WHITE].[SS]
 [BLUE][7"+"][WHITE].[SS][BLUE][7"+"][WHI
 TE].[SS][BLUE]+[WHITE].[SS][BLUE]+[WHITE
 ].[SS][BLUE]+[WHITE].[SS][BLUE]+";         KC
```

```
•150 PRINT"[WHITE][5"."][SS][BLUE]+[WHITE
].[SS][BLUE]+[WHITE][4"."][SS][BLUE]+[WH
ITE][7"."][SS][BLUE]+[WHITE][4"."][SS][B
LUE]+[WHITE].[SS][BLUE]+[WHITE][4"."]  "
;                                         II
•151 PRINT"[WHITE][SS].[SS][SS].[SS][BLUE
]+[WHITE].[SS][BLUE]+[WHITE].[SS][SS].[S
S][BLUE]+[WHITE].[SS][SS].[SS][SS].[SS][
BLUE]+[WHITE].[SS][SS].[SS][BLUE]+[WHITE
].[SS][BLUE]+[WHITE].[SS][SS].[SS][SS]";  HM
•152 PRINT"[BLUE]+[WHITE].[SS][BLUE]+[WHI
TE].[SS][BLUE]+[WHITE][4"."][SS][BLUE]+[
WHITE][4"."][SS][BLUE]+[WHITE].[SS][BLUE
]+[WHITE][4"."][SS][BLUE]+[WHITE][4"."][
SS][BLUE]+[WHITE].[SS][BLUE]+[WHITE].[SS
][BLUE]+";                                CJ
•153 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[S
S][BLUE]+[5"[SS]"]+[3"[SS]"][WHITE].[SS]
[BLUE]+[WHITE].[SS][BLUE]+[WHITE].[4"[SS
]"][BLUE]+[5"[SS]"]+[WHITE].[SS][BLUE]+[
WHITE].[SS][BLUE]+";                      DG
•154 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[S
S][BLUE][10"+"][WHITE].[SS][BLUE]+[WHITE
].[SS][BLUE]+[WHITE].[SS][BLUE][10"+"][W
HITE].[SS][BLUE]+[WHITE].[SS][BLUE]+";    MK
•155 PRINT"+[WHITE].[SS][BLUE]+[WHITE][10
"."][SS][BLUE]+[WHITE].[SS][BLUE]+[WHITE
].[SS][BLUE]+[WHITE].[SS][BLUE]+[WHITE][
10"."][SS][BLUE]+[WHITE].[SS][BLUE]+";    IG
•156 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[8
"[SS]"].[SS][BLUE]+[WHITE].[SS][BLUE]+[W
HITE].[SS][BLUE]+[WHITE].[SS][BLUE]+[WHI
TE].[8"[SS]"].[SS][BLUE]+[WHITE].[SS][BL
UE]+";                                    CO
•157 PRINT"+[WHITE].[SS][BLUE]+[WHITE].[S
S][BLUE][7"+"][WHITE].[SS][BLUE]+[WHITE]
.[SS][BLUE]+[WHITE].[SS][BLUE]+[WHITE].[
SS][BLUE]+[WHITE].[SS][BLUE][7"+"][WHITE
].[SS][BLUE]+[WHITE].[SS][BLUE]+";        HK
•158 PRINT"+[WHITE][16"."][SS][BLUE]+[WHI
TE].[SS][BLUE]+[WHITE][16"."][SS][BLUE]+
";                                        FO
•159 PRINT"+[WHITE].[16"[SS]"][BLUE]+[WHI
TE].[SS][BLUE]+[15"[SS]"][WHITE].[SS][BL
UE]+";                                    EK
•160 PRINT"+[WHITE].[SS][BLUE][16"+"][WHI
TE].[SS][BLUE][16"+"][WHITE].[SS][BLUE]+
";                                        EC
•161 PRINT"+[RED][s Q][WHITE][35"."][RED]
[s Q][BLUE][SS]+";                        ND
•162 PRINT"+[38"[SS]"]+";                 LL
•163 PRINT"[39"+"][HOME]                  HE
•164 POKE2023,43:POKE56295,6              PP
•165 FORK=826TO907:POKEK,0:NEXT           NA
•166 V=53248:POKEV+37,1:POKEV+38,0:POKEV+
39,7:POKEV+40,2:POKEV+41,3:POKEV+42,4     HA
•167 POKEV+43,5:POKEV+28,30:POKEV+23,0:PO
KEV+29,0:POKEV+27,0:POKEV+16,20           MF
•168 POKE844,1:POKE903,INT(RND(1)*256):PO
KE1000,2:POKE1014,2                       JD
•169 POKE831,32:POKE833,32:POKE832,64:POK
E834,64:POKE871,3:POKE872,3:POKE842,1     NO
•170 POKE851,66:POKE852,66:POKE853,226:PO
KE854,226:POKE873,1:POKE874,1             NA
•171 POKE830,176:POKEV,176:POKE850,138:PO
KEV+1,138                                 IF
•172 POKE1008,30:POKE1009,5:POKE913,64    PM
•173 FORK=0TO4:POKEV+(K*2),PEEK(830+K):PO
KEV+(K*2)+1,PEEK(850+K):NEXT              PB
•174 FORK=1TO4:POKE2040+K,251+PEEK(870+K)
:NEXT:POKEV+21,31:POKE53278,0:SYS6226     IA
•175 A=PEEK(1007):POKE1051+A,32:IFA=NMTHE
NGOSUB184:GOTO133                         BB
•176 POKE54276,0:POKE54290,0:POKE54283,0:
POKE54296,15                              KF
•177 POKE54279,0:POKE54280,6:POKE54284,12
:POKE54285,0:POKE54283,129                JO
•178 FORK=0TO255:POKEV+39,K:NEXT          GK
•179 POKEV+21,0:POKE54283,0:POKE54296,0:I
FA>0THEN133                               CB
•180 SC=PEEK(1004)+PEEK(1005)*256:IFSC<HS
THEN105                                   AO
•181 PRINT"[CLEAR][BLUE]":FORI=1TO23:PRIN
T"HIGH SCORE"SPC(20)"HIGH SCORE";:NEXT    BI
•182 PRINT"[HOME][11"[DOWN]"][RED]"SPC(17
)SC                                       KL
•183 HS=SC:GOSUB184:GOTO105               NJ
•184 POKE54272,0:POKE54273,0:POKE54277,0:
POKE54278,240:POKE54276,33:POKE54296,15   KC
•185 FORK=2TO15:POKE53280,K:FORK1=0TO15:P
OKE54273,00+K*K1:NEXTK1,K                 OB
•186 POKE54276,0:POKE53280,0:RETURN       MH
•187 DATA 32,188,64,188,32,220,64,220     HC
•188 DATA"TABIHORICHPONDALFOXSINDU"       GP
•189 DATA"TABIHORICHPONDALFOXSINDU"       GP
•190 DATA"TABIHORICHPONDALFOXSINDU"       GP
•191 DATA"TAIHORICHPONDALFOXSINDU"        LI
```

Starting address in hex: 1838
Ending address in hex: 1CBF

CRUNCHMAN 3

```
1838:  4C 52 18 28 00 29 50 27 B7
1840:  7E 77 7D 7B 08 36 17 2E B2
1848:  10 E8 64 0A 01 27 03 00 DA
1850:  00 00 A9 00 8D 85 03 EE FE
1858:  85 03 AE 85 03 E0 05 90 8E
1860:  03 4C EE 18 BD 70 03 C9 B1
1868:  00 D0 EC AD 85 03 20 E2 5F
1870:  1A AD 84 03 F0 03 4C E8 E8
1878:  18 A9 00 8D 86 03 A2 00 F3
1880:  E8 E0 05 B0 11 BD 5C 03 2E
1888:  C9 2B F0 F4 C9 60 F0 F0 6F
1890:  EE 86 03 4C 80 18 AD 86 22
1898:  03 C9 02 D0 15 AE 85 03 84
18A0:  BD 66 03 AA BD 5C 03 C9 59
```

```
18A8: 2B F0 07 C9 60 F0 03 4C 36
18B0: E8 18 EE 87 03 AE 87 03 64
18B8: BD 00 38 AA BD 5C 03 C9 40
18C0: 2B F0 EF C9 60 F0 EB 8E 62
18C8: 86 03 AE 85 03 BD 66 03 B0
18D0: 18 69 02 C9 05 90 03 38 EE
18D8: E9 04 CD 86 03 F0 D3 AE 91
18E0: 85 03 AD 86 03 9D 66 03 A7
18E8: 20 73 1B 4C 57 18 AD 88 89
18F0: 03 C9 00 D0 08 A9 03 8D D0
18F8: 88 03 4C 54 18 A9 00 8D 74
1900: 88 03 20 44 1C 20 67 1A AD
1908: 20 44 1C AD 8A 03 F0 03 B7
1910: 20 44 1C AD 85 03 D0 60 F7
1918: A0 28 B1 FD C9 2E D0 1F 78
1920: AD F0 03 20 D4 1A A9 02 7C
1928: 8D 8B 03 20 73 1A 18 AD B7
1930: 8C 03 69 01 90 03 EE 8D 3A
1938: 03 8D 8C 03 4C 4D 19 C9 D4
1940: 51 D0 13 A9 FF 8D 8A 03 3A
1948: A9 0F 8D 92 03 A9 20 A0 8E
1950: 28 91 FD 4C 78 19 C9 41 F0
1958: D0 05 A9 64 4C 65 19 C9 D0
1960: 43 D0 15 A9 FA 8D 8B 03 4A
1968: 20 73 1A A9 20 8D 63 04 D4
1970: 8D 64 04 A9 FF 8D 91 03 32
1978: AD 8A 03 C9 01 90 06 8D A2
1980: 25 D0 CE 8A 03 AD 8C 03 10
1988: C9 FF 90 16 8D 91 03 A9 C4
1990: 20 8D 61 04 8D 62 04 8D 25
1998: 65 04 A9 60 8D 8A 04 8D B5
19A0: 8D 04 AD 8D 03 C9 01 D0 0C
19A8: 08 AD 8C 03 C9 43 90 01 8C
19B0: 60 AD 1E D0 8D 90 03 29 F7
19B8: 01 C9 01 D0 56 AD 8A 03 E6
19C0: C9 00 D0 07 CE EF 03 60 84
19C8: 4C 52 18 A9 01 8D 86 03 41
19D0: A2 00 E8 E0 05 B0 3C 0E 3D
19D8: 86 03 AD 86 03 2D 90 03 5A
19E0: CD 86 03 D0 ED AD 86 03 2E
19E8: 49 FF 2D 15 D0 8D 15 D0 B8
19F0: A9 FF 9D 52 03 9D 70 03 9E
19F8: 8E 85 03 20 EC 1B 18 AD FD
1A00: 92 03 6D 92 03 8D 8B 03 B4
1A08: 8D 92 03 20 73 1A A9 20 A2
1A10: 8D 91 03 A9 01 8D 86 03 F3
1A18: A2 00 E8 E0 05 B0 2F 0E 77
1A20: 86 03 BD 70 03 C9 00 F0 95
1A28: F1 DE 70 03 BD 70 03 C9 67
1A30: 01 B0 E7 A9 B0 9D 3E 03 03
1A38: A9 00 9D 48 03 A9 8A 9D 9C
1A40: 52 03 AD 86 03 0D 15 D0 BF
1A48: 8D 15 D0 4C 1A 1A AD 8A 74
1A50: 03 8D 01 D4 AE 91 03 BD B7
1A58: 64 39 8D 0F D4 E0 00 F0 39
1A60: 03 CE 91 03 4C 52 18 A9 27
1A68: 00 85 A2 A5 A2 CD E8 03 92
1A70: 90 F9 60 18 AD EC 03 6D 7E
```

```
1A78: 8B 03 90 03 EE ED 03 8D 08
1A80: EC 03 A9 00 8D 8B 03 AD E3
1A88: EC 03 85 05 AD ED 03 85 27
1A90: 06 A2 00 E8 E0 06 B0 3B F4
1A98: A9 30 8D 86 03 A5 06 DD 13
1AA0: 4C 18 90 26 F0 03 4C B0 AC
1AA8: 1A A5 05 DD 47 18 90 1A 55
1AB0: 38 A5 05 FD 47 18 B0 02 A3
1AB8: C6 06 85 05 38 A5 06 FD F1
1AC0: 4C 18 85 06 EE 86 03 4C 75
1AC8: 9D 1A AD 86 03 9D 08 04 61
1AD0: 4C 93 1A 60 8D 08 D4 A9 3F
1AD8: 00 8D 0B D4 A9 81 8D 0B 0A
1AE0: D4 60 8D 85 03 AA BD 3E D2
1AE8: 03 85 FB BD 48 03 85 FC F8
1AF0: A9 00 8D 84 03 85 FD A9 DC
1AF8: 04 85 FE 38 A5 FB E9 18 5D
1B00: B0 02 C6 FC 85 FB A5 FC 9A
1B08: D0 06 A5 FB C9 08 90 15 F7
1B10: 18 E6 FD 90 02 E6 FE 38 BD
1B18: A5 FB E9 08 B0 02 C6 FC 22
1B20: 85 FB 4C 06 1B A5 FB 8D 3E
1B28: 84 03 BD 52 03 38 E9 32 17
1B30: 8D 86 03 AD 86 03 C9 08 50
1B38: 90 14 38 E9 08 8D 86 03 1E
1B40: 18 A5 FD 69 28 90 02 E6 07
1B48: FE 85 FD 4C 33 1B C9 00 2F
1B50: F0 04 8D 84 03 60 38 A5 98
1B58: FD E9 28 B0 02 C6 FE 85 66
1B60: FD A2 FF E8 E0 05 B0 ED 6E
1B68: BC 3B 18 B1 FD 9D 5C 03 25
1B70: 4C 63 1B AE 85 03 BD 66 96
1B78: 03 C9 02 F0 15 C9 03 F0 0B
1B80: 39 C9 04 F0 42 BD 52 03 CD
1B88: 38 ED F6 03 9D 52 03 4C E7
1B90: EC 1B 18 BD 3E 03 6D F6 14
1B98: 03 90 03 FE 48 03 9D 3E 55
1BA0: 03 BD 48 03 F0 46 BD 3E DF
1BA8: 03 C9 48 90 3F A9 00 9D D4
1BB0: 48 03 A9 1A 9D 3E 03 4C EA
1BB8: EC 1B BD 52 03 18 6D F6 50
1BC0: 03 9D 52 03 4C EC 1B 38 43
1BC8: BD 3E 03 ED F6 03 B0 03 63
1BD0: DE 48 03 9D 3E 03 BD 48 DF
1BD8: 03 D0 11 BD 3E 03 C9 1A A0
1BE0: B0 0A A9 01 9D 48 03 A9 D8
1BE8: 46 9D 3E 03 A0 00 A2 00 51
1BF0: EC 85 03 F0 06 E8 C8 C8 D7
1BF8: 4C F0 1B BD 52 03 C8 99 C6
1C00: 00 D0 88 BD 3E 03 99 00 F1
1C08: D0 A9 01 8D 86 03 A2 00 3D
1C10: EC 85 03 F0 07 E8 0E 86 FA
1C18: 03 4C 10 1C BD 48 03 C9 66
1C20: 00 D0 0B AD 86 03 49 FF 7C
1C28: 2D 10 D0 4C 34 1C AD 86 07
1C30: 03 0D 10 D0 8D 10 D0 AE 3E
1C38: 85 03 18 BD 66 03 69 FB 65
1C40: 9D F8 07 60 A2 00 AD 00 8E
```

```
1C48: DC 8D 8E 03 A5 C5 8D 8F CC
1C50: 03 E8 E0 05 90 03 4C 9B 9D
1C58: 1C AD 8E 03 DD 3F 18 F0 D9
1C60: 08 AD 8F 03 DD 43 18 D0 B2
1C68: E8 8E 3D 03 A9 00 20 E2 CC
1C70: 1A AD 84 03 C9 00 D0 19 73
1C78: AE 3D 03 BD 5C 03 C9 2B 79
1C80: F0 0A C9 60 F0 06 8E 66 91
1C88: 03 4C 91 1C A9 00 8D 66 23
1C90: 03 AD 66 03 C9 00 F0 03 68
1C98: 20 73 1B EE 89 03 AD 89 F9
1CA0: 03 CD E9 03 90 14 CD EA BB
1CA8: 03 90 05 A9 00 8D 89 03 05
1CB0: AD 66 03 18 69 F7 8D F8 C7
1CB8: 07 60 A9 00 4C B3 1C FA E0
```

JAILBREAK

FROM PAGE 26

Starting address in hex: C000
Ending address in hex: CA8F
SYS to start: 49152

***Flankspeed* required for entry! See page 101.**

```
C000: 20 D5 C5 4C 36 C9 AD 1B D0
C008: D4 85 FB C9 3F B0 07 A9 C8
C010: 01 85 FC 4C 33 C0 C9 7F 1D
C018: B0 07 A9 02 85 FC 4C 33 7D
C020: C0 C9 BF B0 07 A9 03 85 54
C028: FC 4C 33 C0 A9 04 85 FC 95
C030: 4C 33 C0 A5 FC C9 01 D0 AE
C038: 13 A5 FD C9 05 90 0A 38 90
C040: A5 FD E9 04 85 FD 4C B7 59
C048: C0 4C 06 C0 C9 02 D0 28 E0
C050: A5 FD C9 04 D0 03 4C 06 E7
C058: C0 C9 08 D0 03 4C 06 C0 D1
C060: C9 0C D0 03 4C 06 C0 C9 E6
C068: 10 D0 03 4C 06 C0 18 A5 1D
C070: FD 69 01 85 FD 4C B7 C0 21
C078: C9 03 D0 13 A5 FD C9 0C A2
C080: B0 0A 18 A5 FD 69 04 85 E9
C088: FD 4C B7 C0 4C 06 C0 A5 04
C090: FD C9 01 D0 03 4C 06 C0 40
C098: C9 05 D0 03 4C 06 C0 C9 18
C0A0: 09 D0 03 4C 06 C0 C9 0D 67
C0A8: D0 03 4C 06 C0 38 A5 FD 6B
C0B0: E9 01 85 FD 4C B7 C0 AD 91
C0B8: 1B D4 8D 25 D0 A5 FC C9 98
C0C0: 00 D0 03 4C 06 C0 C9 01 72
C0C8: D0 06 CE 05 D0 4C EA C0 3C
C0D0: C9 03 D0 06 EE 05 D0 4C 85
C0D8: EA C0 C9 02 D0 06 EE 04 1A
C0E0: D0 4C FD C0 CE 04 D0 4C AC
C0E8: FD C0 A2 00 AD 05 D0 DD AB
C0F0: 00 C7 F0 06 E8 E0 04 D0 4E
C0F8: F3 60 4C 0D C1 A2 00 AD B8
C100: 04 D0 DD FC C6 F0 06 E8 56
C108: E0 04 D0 F3 60 A9 00 85 41
C110: FC 4C B7 C0 00 01 AD 00 80
C118: DC C9 7E D0 03 4C 36 C1 55
C120: C9 7D D0 03 4C 5C C1 C9 6F
C128: 7B D0 03 4C 84 C1 C9 77 4B
C130: D0 03 4C 60 C2 60 A2 00 76
C138: AD 02 D0 DD FC C6 F0 06 51
C140: E8 E0 04 D0 F3 60 A5 02 DA
C148: C9 45 D0 01 60 38 A5 02 69
C150: E9 04 85 02 8D 03 D0 20 47
C158: A1 C2 60 00 A2 00 AD 02 6F
C160: D0 DD FC C6 F0 06 E8 E0 93
C168: 04 D0 F3 60 A5 02 C9 ED F0
C170: D0 01 60 18 A5 02 69 04 CF
C178: 85 02 8D 03 D0 20 A1 C2 E5
C180: 60 61 99 D1 A2 00 AD 03 01
C188: D0 DD 00 C7 F0 08 E8 E0 C1
C190: 04 D0 F3 4C AC C1 A5 FE B8
C198: C9 22 D0 01 60 38 A5 FE 93
C1A0: E9 04 85 FE 8D 02 D0 20 93
C1A8: C4 C2 60 00 AD 03 D0 C9 DB
C1B0: 61 D0 03 4C C5 C1 C9 99 1D
C1B8: D0 03 4C F2 C1 C9 D1 D0 F9
C1C0: 03 4C 1F C2 60 A5 FE C9 C0
C1C8: 46 D0 0A AD F4 04 C9 27 81
C1D0: D0 1F 4C 4C C2 C9 8E D0 45
C1D8: 0A AD FD 04 C9 27 D0 11 65
C1E0: 4C 4C C2 C9 D6 D0 0A AD 65
C1E8: 06 05 C9 27 D0 03 4C 4C 51
C1F0: C2 60 A5 FE C9 46 D0 0A A3
C1F8: AD 0C 06 C9 27 D0 1F 4C E5
C200: 4C C2 C9 8E D0 0A AD 15 05
C208: 06 C9 27 D0 11 4C 4C C2 3C
C210: C9 D6 D0 0A AD 1E 06 C9 27
C218: 27 D0 03 4C 4C C2 60 A5 74
C220: FE C9 46 D0 0A AD 24 07 E2
C228: C9 27 D0 1F 4C 4C C2 C9 2E
C230: 8E D0 0A AD 2D 07 C9 27 6C
C238: D0 11 4C 4C C2 C9 D6 D0 E6
C240: 0A AD 36 07 C9 27 D0 03 F9
C248: 4C 4C C2 60 38 A5 FE E9 CA
C250: 24 85 FE CE 02 D0 AD 02 4A
C258: D0 C5 FE D0 F6 60 00 00 16
C260: A2 00 AD 03 D0 DD 00 C7 2A
C268: F0 08 E8 E0 04 D0 F3 4C 40
C270: 87 C2 A5 FE C9 FA D0 01 F5
C278: 60 18 A5 FE 69 04 85 FE 87
C280: 8D 02 D0 20 C4 C2 60 AD 96
C288: 03 D0 C9 61 D0 03 4C DD 85
C290: C2 C9 99 D0 03 4C 4C C3 E6
C298: C9 D1 D0 03 4C BB C3 60 34
C2A0: 00 A2 00 AD 03 D0 DD 00 A2
C2A8: C7 F0 15 E8 E0 04 D0 F3 09
C2B0: A2 00 AD 03 D0 DD 81 C1 F5
C2B8: F0 06 E8 E0 03 D0 F3 60 A1
C2C0: 20 44 CA 60 A2 00 AD 02 A2
C2C8: D0 DD FC C6 F0 06 E8 E0 FB
C2D0: 04 D0 F3 60 20 44 CA 60 89
C2D8: 60 00 00 00 00 A5 FE C9 A7
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C2E0: 22 D0 20 AD F4 04 C9 27 8B
C2E8: D0 61 AD F6 04 C9 29 D0 87
C2F0: 08 A9 20 8D F6 04 20 30 9B
C2F8: C5 C9 0C D0 03 20 06 C7 56
C300: 4C 2A C4 C9 6A D0 20 AD 0E
C308: FD 04 C9 27 D0 3D AD FF B6
C310: 04 C9 29 D0 08 A9 20 8D 37
C318: FF 04 20 30 C5 C9 0C D0 D8
C320: 03 20 06 C7 4C 2A C4 C9 16
C328: B2 D0 20 AD 06 05 C9 27 75
C330: D0 19 AD 08 05 C9 29 D0 98
C338: 08 A9 20 8D 08 05 20 30 F4
C340: C5 C9 0C D0 03 20 06 C7 9D
C348: 4C 2A C4 60 A5 FE C9 22 74
C350: D0 20 AD 0C 06 C9 27 D0 C2
C358: 61 AD 0E 06 C9 29 D0 08 47
C360: A9 20 8D 0E 06 20 30 C5 E1
C368: C9 0C D0 03 20 06 C7 4C 4C
C370: 2A C4 C9 6A D0 20 AD 15 47
C378: 06 C9 27 D0 3D AD 17 06 48
C380: C9 29 D0 08 A9 20 8D 17 BA
C388: 06 20 30 C5 C9 0C D0 03 4E
C390: 20 06 C7 4C 2A C4 C9 B2 36
C398: D0 20 AD 1E 06 C9 27 D0 1D
C3A0: 19 AD 20 06 C9 29 D0 08 59
C3A8: A9 20 8D 20 06 20 30 C5 3C
C3B0: C9 0C D0 03 20 06 C7 4C 94
C3B8: 2A C4 60 A5 FE C9 22 D0 69
C3C0: 20 AD 24 07 C9 27 D0 61 DC
C3C8: AD 26 07 C9 29 D0 08 A9 19
C3D0: 20 8D 26 07 20 30 C5 C9 8B
C3D8: 0C D0 03 20 06 C7 4C 2A 1D
C3E0: C4 C9 6A D0 20 AD 2D 07 AC
C3E8: C9 27 D0 3D AD 2F 07 C9 95
C3F0: 29 D0 08 A9 20 8D 2F 07 80
C3F8: 20 30 C5 C9 0C D0 03 20 D8
C400: 06 C7 4C 2A C4 C9 B2 D0 56
C408: 20 AD 36 07 C9 27 D0 19 ED
C410: AD 38 07 C9 29 D0 08 A9 72
C418: 20 8D 38 07 20 30 C5 C9 E4
C420: 0C D0 03 20 06 C7 4C 2A 64
C428: C4 60 18 A5 FE 69 24 85 1D
C430: FE EE 02 D0 AD 02 D0 C5 37
C438: FE D0 F6 60 A9 3A 8D EB BC
C440: 04 AD 09 DC 29 70 4A 4A 06
C448: 4A 4A 18 69 30 8D EC 04 0D
C450: AD 09 DC 29 0F 18 69 30 CD
C458: 8D ED 04 AD 0A DC 29 70 06
C460: 4A 4A 4A 4A 18 69 30 8D C8
C468: E9 04 AD 0A DC 29 0F 18 3B
C470: 69 30 8D EA 04 60 00 A9 90
C478: 01 8D AF C4 A2 00 A0 25 E3
C480: 4C 8D C4 AD 1B D4 C9 09 8F
C488: B0 24 AA A0 27 BD 38 C7 8D
C490: 8D 9B C4 BD 42 C7 8D 9A 6E
C498: C4 8C 0C 06 AD AF C4 F0 0F
C4A0: 0D 20 B0 C4 E8 E0 09 D0 E6
C4A8: E4 A9 00 8D AF C4 60 00 99
C4B0: A9 8F 8D 18 D4 A9 81 8D 1D
C4B8: 0B D4 18 A5 A2 69 0A C5 32
C4C0: A2 D0 FC A9 80 8D 0B D4 C8
C4C8: A9 00 8D 18 D4 60 A9 8F 86
C4D0: 8D 18 D4 A9 00 8D 0F D4 66
C4D8: A9 10 8D 12 D4 A9 01 8D 3F
C4E0: 03 D4 A9 F0 8D 06 D4 A9 65
C4E8: 41 8D 04 D4 A9 28 8D 00 EF
C4F0: D4 A9 14 8D 01 D4 18 A5 A4
C4F8: A2 69 02 C5 A2 D0 FC EE 2C
C500: F2 C4 AD F2 C4 C9 1B D0 D2
C508: 05 A9 14 8D F2 C4 EE ED EC
C510: C4 AD ED C4 C9 F0 D0 D4 95
C518: A9 40 8D 04 D4 A9 28 8D C7
C520: ED C4 A9 14 8D F2 C4 A9 7F
C528: 80 8D 0F D4 8D 12 D4 60 EE
C530: EE 03 06 AD 03 06 C9 31 D9
C538: D0 0E A2 00 BD 4C C7 9D 29
C540: 00 04 E8 E0 03 D0 F5 60 38
C548: C9 32 D0 0E A2 00 BD 4F D2
C550: C7 9D 04 04 E8 E0 04 D0 5C
C558: F5 60 C9 33 D0 0E A2 00 2D
C560: BD 53 C7 9D 09 04 E8 E0 AD
C568: 03 D0 F5 60 C9 34 D0 0E 6F
C570: A2 00 BD 56 C7 9D 0D 04 9D
C578: E8 E0 08 D0 F5 60 C9 35 70
C580: D0 0E A2 00 BD 5E C7 9D 83
C588: 16 04 E8 E0 02 D0 F5 60 95
C590: C9 36 D0 0E A2 00 BD 60 30
C598: C7 9D 19 04 E8 E0 05 D0 BA
C5A0: F5 60 C9 37 D0 0D A2 00 78
C5A8: BD 65 C7 9D 1F 04 E8 E0 1E
C5B0: 09 D0 F5 60 AD 1E D0 C9 47
C5B8: 06 D0 14 A9 8E 85 FE 8D ED
C5C0: 02 D0 A9 99 85 02 8D 03 EE
C5C8: D0 20 CE C4 20 7D CA A9 5F
C5D0: 00 8D 1E D0 60 AD 0E DC 46
C5D8: 29 FE 8D 0E DC A5 01 29 49
C5E0: FB 85 01 A2 00 BD 00 D0 94
C5E8: 9D 00 38 E8 E0 00 D0 F5 4F
C5F0: A2 00 BD 00 D1 9D 00 39 F9
C5F8: E8 E0 00 D0 F5 A2 00 BD E9
C600: 6F C7 9D 18 39 E8 E0 38 28
C608: D0 F5 A5 01 09 04 85 01 09
C610: AD 0E DC 09 01 8D 0E DC 2B
C618: A2 00 BD A7 C7 9D 00 D0 56
C620: E8 E0 06 D0 F5 A2 00 BD 17
C628: AD C7 9D 15 D0 E8 E0 16 01
C630: D0 F5 A2 00 BD C2 C7 9D 7F
C638: 00 30 E8 E0 00 D0 F5 A9 A2
C640: 93 20 D2 FF A2 00 A9 0A 1D
C648: 9D 00 D8 9D FA D8 9D F4 C2
C650: D9 9D E7 DA E8 E0 00 D0 25
C658: EF A2 00 A9 28 9D 00 04 5E
C660: A9 07 9D 00 D8 A9 26 9D F4
C668: 28 04 A9 05 9D 28 D8 E8 CA
C670: E0 28 D0 E7 A2 00 BD C3 56
C678: C8 9D A4 04 9D 44 05 9D 0C
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C680: BC 05 9D 5C 06 9D D4 06 BA
C688: 9D 74 07 BD DF C8 9D CC 72
C690: 04 9D 1C 05 9D E4 05 9D 78
C698: 34 06 9D FC 06 9D 4C 07 64
C6A0: BD FB C8 9D F4 04 9D 0C 63
C6A8: 06 9D 24 07 E8 E0 1C D0 2E
C6B0: C5 A9 25 8D 6F 04 8D 97 6B
C6B8: 04 8D 87 05 8D AF 05 8D A6
C6C0: 9F 06 8D C7 06 8D B7 07 0E
C6C8: 8D DF 07 A2 00 BD 17 C9 7E
C6D0: 9D C1 04 A9 07 9D C1 D8 1D
C6D8: E8 E0 04 D0 F0 A2 00 BD C8
C6E0: 56 C7 9D D8 05 A9 07 9D C8
C6E8: D8 D9 E8 E0 08 D0 F0 A9 D8
C6F0: 20 8D 17 06 4C 15 C7 02 E6
C6F8: D0 4C 15 00 22 6A B2 FA 65
C700: 45 7D B5 ED 00 00 AD 03 17
C708: 06 C9 37 D0 05 A9 01 8D 1D
C710: FB C6 60 00 00 A2 00 A9 7F
C718: 01 9D E9 D8 E8 E0 05 D0 19
C720: F8 8D 03 DA A9 0B 8D 21 E7
C728: D0 A9 00 8D FB C6 8D 0B 8B
C730: DC 8D 0A DC 8D 09 DC 60 55
C738: 04 04 05 06 06 06 07 07 65
C740: 07 00 F4 FD 06 0C 15 1E 7F
C748: 24 2D 36 00 19 0F 15 08 15
C750: 01 16 05 14 08 05 05 16 A8
C758: 09 04 05 0E 03 05 14 0F A3
C760: 03 0C 05 01 12 19 0F 15 C4
C768: 12 13 05 0C 06 21 00 55 1B
C770: 7F 7F 55 F7 F7 F7 55 7F 81
C778: 7F 7F 55 F7 F7 F7 55 A0 AA
C780: A0 A0 A0 A0 A0 A0 A0 FF E4
C788: FF FF FF FF FF FF FF AA 33
C790: AA 00 00 00 00 00 00 00 3B
C798: 00 00 00 00 00 AA AA 01 EE
C7A0: 05 19 66 99 64 50 40 88 3C
C7A8: 92 8E 99 B2 B5 07 D8 01 AC
C7B0: 1F 7C F0 00 04 00 03 00 44
C7B8: 00 0B 0F 00 F3 00 06 00 CC
C7C0: 07 00 AA AA AA 20 82 08 72
C7C8: 20 82 08 20 82 08 20 82 C0
C7D0: 08 AA AA AA AA AA AA 20 F8
C7D8: 82 08 20 82 08 20 82 08 B8
C7E0: 20 82 08 AA AA AA 00 00 8B
C7E8: 00 00 00 00 00 00 00 00 E8
C7F0: 00 00 00 00 00 00 00 00 F0
C7F8: 00 00 00 00 00 00 00 00 F8
C800: 00 00 00 00 00 06 00 00 06
C808: 0F 00 00 06 00 00 3F 80 DC
C810: 00 06 40 00 0F 00 00 11 76
C818: 00 00 30 C0 00 00 00 00 09
C820: 00 00 00 00 00 00 00 00 20
C828: 00 00 00 00 00 00 00 00 28
C830: 00 00 00 00 00 00 00 00 30
C838: 00 00 00 00 00 00 00 00 38
C840: 00 00 00 00 00 06 00 00 46
C848: 0F 00 00 06 00 00 1E 00 7B
C850: 00 26 00 00 0E 00 00 0A 8E
C858: 00 00 1B 00 00 00 00 00 73
C860: 00 00 00 00 00 00 00 00 60
C868: 00 00 00 00 00 00 00 00 68
C870: 00 00 00 00 00 00 00 00 70
C878: 00 00 00 00 00 00 00 00 78
C880: 00 00 80 20 00 80 20 00 C1
C888: 3F C0 00 3F C0 00 35 C0 7E
C890: 00 35 C0 00 3F C0 00 3F C5
C898: C0 00 80 20 00 80 20 00 9A
C8A0: 00 00 00 00 00 00 00 00 A0
C8A8: 00 00 00 00 00 00 00 00 A8
C8B0: 00 00 00 00 00 00 00 00 B0
C8B8: 00 00 00 00 00 00 00 00 B8
C8C0: 00 00 00 23 23 23 23 23 70
C8C8: 20 20 20 20 23 23 23 23 D5
C8D0: 23 20 20 20 20 23 23 23 DD
C8D8: 23 23 20 20 20 20 25 23 E7
C8E0: 20 20 20 23 20 20 20 20 E4
C8E8: 23 20 20 20 23 20 20 20 EF
C8F0: 20 23 20 20 20 23 20 20 F7
C8F8: 20 20 25 25 20 29 20 24 11
C900: 20 20 20 20 25 20 29 20 0F
C908: 24 20 20 20 20 25 20 29 1B
C910: 20 24 20 20 20 20 25 14 0E
C918: 09 0D 05 00 00 00 01 00 34
C920: 00 00 00 10 00 00 00 08 38
C928: 00 00 80 00 00 80 00 00 29
C930: 00 00 00 8F FF 00 A2 00 62
C938: BD 1B C9 9D 00 D4 E8 E0 17
C940: 19 D0 F5 AD 02 D0 85 FE 25
C948: AD 03 D0 85 02 A9 00 8D 88
C950: 20 D0 8D FB C6 8D AF C4 93
C958: 85 FC A2 C0 8E F8 07 E8 B5
C960: 8E F9 07 E8 E8 8E FA 07 52
C968: A2 00 BD CA C9 9D 82 04 81
C970: A9 00 9D 82 D8 E8 E0 0B E7
C978: D0 F0 A9 27 8D 15 06 A9 5D
C980: 30 8D 03 06 A9 0B 85 FD 7F
C988: A2 00 BD D5 C9 9D 19 07 46
C990: A9 07 9D 19 DB BD DA C9 36
C998: 9D 41 07 A9 07 9D 41 DB E9
C9A0: E8 E0 05 D0 E5 A9 0C 8D 69
C9A8: 38 07 A9 03 8D 38 DB AD E3
C9B0: 00 DC C9 6F D0 F9 A2 00 34
C9B8: A9 20 9D 82 04 E8 E0 0B 7B
C9C0: D0 F8 A9 00 8D 08 DC 4C F2
C9C8: E0 C9 10 12 05 13 13 20 E0
C9D0: 20 06 09 12 05 0A 01 09 2B
C9D8: 0C 20 02 12 05 01 0B 04 2E
C9E0: EE 14 C1 AD 14 C1 C9 14 07
C9E8: D0 19 A9 00 8D 14 C1 AD 8D
C9F0: F9 07 C9 C1 F0 08 A9 C1 E1
C9F8: 8D F9 07 4C 03 CA A9 C2 0E
CA00: 8D F9 07 AC 15 C1 20 B7 E9
CA08: C0 88 C0 00 D0 F8 20 16 12
CA10: C1 20 44 CA 20 3C C4 20 42
CA18: B4 C5 AD FB C6 F0 03 4C 43
```

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CA20: 59 CA EE F7 C6 AD F7 C6 5E
CA28: D0 0A AD 1B D4 C9 08 B0 23
CA30: 03 20 77 C4 AD 1B D4 C9 F6
CA38: E6 B0 03 4C E0 C9 20 83 6D
CA40: C4 4C E0 C9 A9 08 8D DF 1B
CA48: C9 A2 00 E8 E0 00 D0 FB 4B
CA50: CE DF C9 AD DF C9 D0 F1 E2
CA58: 60 8D 0B DC A2 00 BD CA 59
CA60: C9 9D 82 04 A9 00 9D 82 18
CA68: D8 E8 E0 0B D0 F0 A9 01 82
CA70: 8D 15 C1 AD 00 DC C9 6F 98
CA78: D0 F9 4C 00 C0 AD 15 C1 D4
CA80: C9 04 F0 03 EE 15 C1 20 28
CA88: 77 C4 60 0F F0 0F F0 0F 34
```

SIXFORTY
FROM PAGE 86

BASIC LOADER

```
·20 FORI=49152TO49482STEP10:FORA=0TO9:REA
DB:C=C+B:POKEI+A,B                           NM
·21 IFF=0THENF=1:G=G+B:GOTO25                CH
·22 IFF=1THENF=0:H=H+B                       NH
·25 NEXT:E=E+C                               PE
·30 READD:IFC<>DTHENPRINT"ERROR IN DATA S
TATEMENT "I"[LEFT].":END                     JO
·40 C=0:NEXTI                                DI
·50 IFG<>27700ORH<>25923THENPRINT"ONE OR
MORE ENTRIES IN WRONG ORDER":END             FP
·60 IFE<>53623THENPRINT"ERROR IN DATA STA
TEMENTS.  CHECK FOR TYPING ERROR.":END       NM
·70 PRINT"SIXFORTY ML PORTION POKED INTO
MEMORY.  NOW SAVING SIXFORTYMLA TO DISK"     KE
·80 GOTO60100                                IE
·49152 DATA 169, 0, 133, 251, 169, 96, 13
3, 252, 160, 0, 1363                         AK
·49162 DATA 169, 248, 133, 253, 169, 95,
133, 254, 169, 0, 1623                       LI
·49172 DATA 141, 252, 3, 169, 128, 141, 2
53, 3, 169, 248, 1507                        OG
·49182 DATA 141, 254, 3, 169, 127, 141, 2
55, 3, 177, 251, 1521                        DI
·49192 DATA 153, 248, 95, 200, 192, 8, 24
0, 3, 76, 38, 1253                           BC
·49202 DATA 192, 177, 251, 145, 253, 200,
 192, 0, 208, 247, 1865                      CA
·49212 DATA 230, 252, 230, 254, 177, 251,
 145, 253, 200, 192, 2184                    ON
·49222 DATA 64, 208, 247, 165, 251, 24, 1
05, 56, 133, 251, 1504                       BO
·49232 DATA 144, 2, 230, 252, 160, 0, 173
, 252, 3, 133, 1349                          FD
·49242 DATA 253, 173, 253, 3, 133, 254, 1
77, 253, 145, 251, 1895                      KI
·49252 DATA 200, 192, 8, 208, 247, 165, 2
51, 24, 105, 8, 1408                         PA
·49262 DATA 133, 251, 144, 2, 230, 252, 1
65, 252, 133, 254, 1816                      MD
·49272 DATA 165, 251, 56, 233, 8, 133, 25
3, 176, 2, 198, 1475                         IN
·49282 DATA 254, 160, 8, 165, 251, 141, 2
32, 7, 165, 252, 1635                        IB
·49292 DATA 141, 233, 7, 165, 253, 141, 2
34, 7, 165, 254, 1600                        FK
·49302 DATA 141, 235, 7, 173, 252, 3, 133
, 251, 173, 253, 1621                        MB
·49312 DATA 3, 133, 252, 173, 254, 3, 133
, 253, 173, 255, 1632                        OD
·49322 DATA 3, 133, 254, 177, 251, 145, 2
53, 200, 192, 0, 1608                        BA
·49332 DATA 240, 3, 76, 173, 192, 230, 25
2, 230, 254, 165, 1815                       NN
·49342 DATA 252, 201, 159, 208, 7, 165, 2
51, 201, 64, 144, 1652                       FN
·49352 DATA 1, 96, 177, 251, 145, 253, 20
0, 192, 72, 208, 1595                        DN
·49362 DATA 247, 165, 251, 24, 105, 56, 1
33, 251, 144, 2, 1378                        AA
·49372 DATA 230, 252, 160, 0, 185, 248, 9
5, 145, 251, 200, 1766                       BC
·49382 DATA 192, 8, 208, 246, 160, 0, 165
, 251, 24, 105, 1359                         MJ
·49392 DATA 8, 133, 251, 144, 2, 230, 252
, 165, 252, 133, 1570                        PK
·49402 DATA 254, 165, 251, 56, 233, 8, 13
3, 253, 176, 2, 1531                         FF
·49412 DATA 198, 254, 165, 252, 201, 159,
 208, 8, 165, 251, 1861                      CE
·49422 DATA 201, 64, 144, 2, 96, 96, 160,
 0, 165, 251, 1179                           GI
·49432 DATA 141, 252, 3, 165, 252, 141, 2
53, 3, 165, 253, 1628                        NM
·49442 DATA 141, 254, 3, 165, 254, 141, 2
55, 3, 173, 232, 1621                        ML
·49452 DATA 7, 133, 251, 173, 233, 7, 133
, 252, 173, 234, 1596                        HM
·49462 DATA 7, 133, 253, 173, 235, 7, 133
, 254, 76, 38, 1309                          PF
·49472 DATA 192, 0, 255, 255, 0, 0, 255,
255, 162, 0, 1374                            LD
·49482 DATA 255, 255, 0, 0, 255, 255, 0,
0, 255, 255, 1530                            IG
·60000 OPEN15,8,15:SAVE"TEM",8:PRINT#15,"
S:SIXFORTY BASIC"                            DI
·60010 PRINT#15,"R:SIXFORTY BASIC=TEM":VE
RIFY"SIXFORTY BASIC",8                       PK
·60015 INPUT#15,A$,B$,C$,D$                  CN
·60020 PRINTA$,B$,C$,D$:CLOSE15:END          MF
```

```
•60100 OPEN15,8,15,"S:SIXFORTYMLA"                NL
•60105 OPEN1,8,1,"0:SIXFORTYMLA,P,W":PRIN
T#1,CHR$(0)CHR$(192);                             AA
•60110 RESTORE:FORI=49152TO49491:PRINT#1,
CHR$(PEEK(I));:NEXT:CLOSE1                        GD
•60115 VERIFY"SIXFORTYMLA",8,1                    CO
•60120 INPUT#15,A$,B$,C$,D$:PRINTA$,B$:CL
OSE15:END                                         AP
```

SIXFORTYBAS

```
•61000 GETA$:IFA$=""THEN61000                     OD
•61001 IFA$="T"THENGOSUB61006                     HL
•61002 IFA$="H"THENGOSUB61015                     FN
•61003 IFA$="[BACKARROW]"THENGOSUB61012           JB
•61004 IFA$="C"THENGOSUB61013                     GE
•61005 GOTO61000:REM CHANGE LINE NUMBER T
O MATCH YOUR GRAPHICS PROGRAM                     KC
•61006 :REM TEXT MODE                             DN
•61007 POKE56578,PEEK(56578)OR3                   BN
•61008 POKE56576,(PEEK(56576)AND252)OR3           KF
•61009 POKE53272,21                               CN
•61010 POKE53265,27                               DL
•61011 RETURN                                     IM
•61012 SYS49152:RETURN                            GI
•61013 N=1:FORI=0TO999:POKE22528+I,N:NEXT
:RETURN:REM CHANGE N TO CHANGE HIRES              JC
•61014 REM COLORS. 16*(INK COLOR#)+(BACKG
ROUND COLOR#)                                     GL
•61015 :REM HI RES MODE                           GI
•61016 POKE56578,PEEK(56578)OR3                   BN
•61017 POKE56576,(PEEK(56576)AND252)OR2           KG
•61018 POKE53272,(PEEK(53272)AND15)OR104          BA
•61019 POKE53265,PEEK(53265)OR32                  AL
•61020 RETURN                                     IM
```

TURTLE RESCUE
FROM PAGE 15

Starting address in hex: C000
Ending address in hex: CD9F
SYS to start: 49152

***Flankspeed* required for entry! See page 101.**

```
C000: A9 C1 8D 18 03 A0 00 A9 5E
C008: 00 B9 1A C0 99 00 20 C8 1F
C010: C0 40 D0 F5 4C 17 C0 4C 48
C018: 5E C0 00 00 00 00 00 00 37
C020: 00 00 00 00 00 00 00 00 20
C028: 00 00 00 00 00 00 00 00 28
C030: 00 00 00 00 00 00 00 00 30
C038: 0B C1 40 2B C5 50 A8 C5 F4
C040: 50 A8 D1 44 AA 94 14 A2 45
C048: 91 44 0A 85 50 00 11 44 53
C050: 00 14 17 00 2A 28 00 A8 76
C058: A8 00 00 00 00 00 A0 00 A1
C060: A9 00 B9 73 C0 99 40 20 F1
C068: C8 C0 40 D0 F5 4C 70 C0 76
C070: 4C B5 C0 00 00 00 00 00 33
C078: 00 00 00 00 00 00 00 00 78
C080: 00 00 00 00 00 00 00 00 80
C088: 00 00 00 00 00 00 00 00 88
C090: 00 0B C1 40 2B C5 50 A8 87
C098: C5 50 A8 D1 44 A2 94 14 B8
C0A0: 82 91 44 0A 85 50 00 11 E9
C0A8: 44 00 14 17 00 CA 28 00 0B
C0B0: CA 8A 00 00 00 A0 00 A9 50
C0B8: 00 B9 CA C0 99 80 20 C8 01
C0C0: C0 40 D0 F5 4C C7 C0 4C A9
C0C8: 0E C1 00 00 00 00 00 00 98
C0D0: 00 00 00 00 00 00 00 00 D0
C0D8: 00 00 00 00 00 00 00 00 D8
C0E0: 00 00 00 00 00 00 00 00 E0
C0E8: 01 43 E0 05 53 E8 05 53 A7
C0F0: 2A 11 47 2A 14 16 AA 11 83
C0F8: 46 8A 05 52 A0 11 44 00 17
C100: D4 14 00 28 A8 00 2A 2A 0E
C108: 00 00 00 00 00 00 A0 00 A8
C110: A9 00 B9 23 C1 99 C0 20 D2
C118: C8 C0 40 D0 F5 4C 20 C1 D6
C120: 4C 67 C1 00 00 00 00 00 95
C128: 00 00 00 00 00 00 00 00 28
C130: 00 00 00 00 00 00 00 00 30
C138: 00 00 00 00 00 00 00 00 38
C140: 00 01 43 E0 05 53 E8 05 AB
C148: 53 2A 11 47 2A 14 16 8A FC
C150: 11 46 82 05 52 A0 11 44 77
C158: 00 D4 14 00 28 A3 00 A2 AF
C160: A3 00 00 00 00 00 00 A0 A4
C168: 00 A9 00 B9 7C C1 99 00 A3
C170: 21 C8 C0 40 D0 F5 4C 79 E7
C178: C1 4C C0 C1 00 00 00 00 09
C180: 00 00 00 00 00 00 00 00 80
C188: 00 00 00 04 00 04 05 2A BF
C190: 14 11 FB D1 15 C8 D5 10 47
C198: C8 C1 05 AA 94 04 6A 44 1A
C1A0: 04 40 44 04 11 04 01 00 43
C1A8: 10 00 00 00 00 00 00 00 B8
C1B0: 00 00 00 00 00 00 00 00 B0
C1B8: 00 00 00 00 00 00 00 00 B8
C1C0: A0 00 A9 00 B9 D5 C1 99 F5
C1C8: 40 21 C8 C0 40 D0 F5 4C 07
C1D0: D2 C1 4C 19 C2 00 00 00 8D
C1D8: 00 00 00 00 00 00 00 00 D8
C1E0: 00 00 00 00 00 00 00 01 E1
C1E8: 2A 10 01 FB D0 05 C8 D4 93
C1F0: 04 C8 C4 01 AA 90 01 6A 2A
C1F8: 50 01 40 50 01 11 10 00 FC
C200: 40 40 00 00 00 00 00 00 80
C208: 00 00 00 00 00 00 00 00 08
C210: 00 00 00 00 00 00 00 00 10
C218: 00 A0 00 A9 00 B9 2E C2 0D
C220: 99 80 21 C8 C0 40 D0 F5 EB
C228: 4C 2B C2 4C 72 C2 00 00 E3
C230: 00 00 00 00 00 00 00 00 30
C238: 00 00 00 20 00 00 20 00 78
```

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C240: 00 20 00 00 A8 00 00 A8 B1
C248: 00 02 AA 00 02 AA 00 02 A3
C250: AA 00 02 AA 00 02 EA 00 94
C258: 00 F8 00 00 00 00 00 00 51
C260: 00 00 00 00 00 00 00 00 60
C268: 00 00 00 00 00 00 00 00 68
C270: 00 00 A0 00 A9 00 B9 87 FB
C278: C2 99 C0 21 C8 C0 40 D0 51
C280: F5 4C 84 C2 4C CB C2 00 E4
C288: 00 00 00 00 00 00 00 00 88
C290: 00 00 00 00 00 00 00 2A BA
C298: A8 00 02 80 00 02 80 00 46
C2A0: 02 80 00 2A A8 0B C1 40 03
C2A8: 2B C5 50 A8 C5 50 A8 D1 23
C2B0: 44 AA 94 14 A2 91 44 0A CA
C2B8: 85 50 00 11 44 00 14 17 0F
C2C0: 00 2A 28 00 A8 A8 00 00 64
C2C8: 00 00 00 A0 00 A9 00 B9 CC
C2D0: E0 C2 99 00 22 C8 C0 40 F9
C2D8: D0 F5 4C DD C2 4C 1E C3 BA
C2E0: 00 00 00 00 00 00 00 00 E0
C2E8: 00 00 00 00 00 00 00 00 E8
C2F0: 2A A8 00 02 80 00 02 80 C8
C2F8: 00 02 80 00 2A A8 0B C1 1B
C300: 40 3F C5 50 A8 C5 50 A8 FC
C308: D1 44 A2 94 14 82 91 44 C1
C310: 0A 85 50 00 11 44 00 14 59
C318: 17 00 CA 28 00 CA A0 00 8D
C320: A9 00 B9 33 C3 99 40 22 76
C328: C8 C0 40 D0 F5 4C 30 C3 F8
C330: 4C 77 C3 00 00 00 00 00 B7
C338: 00 00 00 00 00 00 00 00 38
C340: 00 00 2A A8 00 02 80 00 95
C348: 02 80 00 02 80 00 2A A8 20
C350: 00 01 43 E0 05 53 E8 05 BB
C358: 53 2A 11 47 2A 14 16 AA 2D
C360: 11 46 8A 05 52 A0 11 44 8F
C368: 00 D4 14 00 28 A8 00 2A 4C
C370: 2A 00 00 00 00 00 00 A0 3B
C378: 00 A9 00 B9 8C C3 99 80 46
C380: 22 C8 C0 40 D0 F5 4C 89 09
C388: C3 4C D0 C3 00 00 00 00 2D
C390: 00 00 00 00 00 00 00 00 90
C398: 00 00 00 2A A8 00 02 80 ED
C3A0: 00 02 80 00 02 80 00 2A CF
C3A8: A8 00 01 43 E0 05 53 E8 B7
C3B0: 05 53 2A 11 47 2A 14 16 DF
C3B8: 8A 11 46 82 05 52 A0 11 26
C3C0: 44 00 D4 14 00 28 A3 00 B9
C3C8: A2 A3 00 00 FF 20 FF 20 4F
C3D0: A9 00 8D B3 0F A9 00 8D 02
C3D8: 18 D4 A9 01 8D B1 0F A9 68
C3E0: 84 8D A8 0F A9 00 8D D1 B3
C3E8: 0B A9 08 8D A9 0F A9 00 95
C3F0: 8D AB 0F 8D AF 0F A9 93 C2
C3F8: 20 D2 FF A9 80 8D 10 D0 84
C400: A9 0C 8D 0E D0 A9 42 8D 9B
C408: CE 0B A9 80 8D FF 07 A2 43
C410: 82 8E 0F D0 A9 11 8D 04 4D
C418: D4 A9 0F 8D 05 D4 A9 80 37
C420: 8D A0 0F A9 81 8D A1 0F C6
C428: A9 82 8D A2 0F A9 83 8D 4E
C430: A3 0F 8D CF 0B A9 55 8D D7
C438: 0D D0 8D CD 0B A9 86 8D 3A
C440: FE 07 8D D1 0B A0 00 8C DD
C448: A4 0F C8 8C A5 0F A0 00 A6
C450: B9 5E C4 99 C8 07 C8 C0 20
C458: 11 D0 F5 4C 6F C4 14 15 D9
C460: 12 14 0C 05 13 20 12 05 E1
C468: 13 03 15 05 04 20 30 20 0D
C470: 5F CD A9 0A 8D BC 0B 8D 34
C478: BD 0B A9 84 8D BE 0B 8D 54
C480: 0C D0 8D D0 0B A9 8C 8D 8A
C488: BF 0B A9 C8 8D C3 0B A9 CB
C490: 82 8D C0 0B A9 64 8D C1 C9
C498: 0B A9 96 8D C2 0B A9 0A F2
C4A0: 8D 20 D0 A9 00 8D 21 D0 48
C4A8: A9 FF 8D 1C D0 8D 15 D0 40
C4B0: A9 82 8D F8 07 8D BA 0B BD
C4B8: A9 D5 8D B8 0B 8D 01 D0 E8
C4C0: A9 1E 8D 00 D0 8D B9 0B 39
C4C8: A9 07 8D 26 D0 A9 0A 8D 3F
C4D0: 27 D0 A9 0F 8D 25 D0 A9 AE
C4D8: 0E 8D 2D D0 A2 79 8E FB 19
C4E0: 05 8E FC 05 8E FD 05 8E 96
C4E8: FE 05 8E FF 05 8E 00 06 15
C4F0: A0 00 A9 78 99 98 07 A9 96
C4F8: 64 99 A0 04 A9 0D 99 98 84
C500: DB C8 C0 22 D0 EC A0 00 E5
C508: A9 65 8D CD 04 8D F5 04 FD
C510: 8D 1D 05 8D 45 05 8D 6D 92
C518: 05 8D 95 05 8D BD 05 8D 23
C520: E5 05 8D 0D 06 8D 35 06 74
C528: 8D 5D 06 8D 85 06 8D AD 6D
C530: 06 8D D5 06 8D FD 06 8D BE
C538: 25 07 8D 4D 07 A9 5D 8D DA
C540: D2 04 8D FA 04 8D 22 05 58
C548: 8D 4A 05 8D 72 05 8D 9A 52
C550: 05 8D C2 05 8D EA 05 8D B5
C558: 12 06 8D 3A 06 8D 62 06 34
C560: 8D 8A 06 8D 8A 06 8D B2 DC
C568: 06 8D DA 06 8D 02 07 8D 01
C570: 2A 07 8D 52 07 A9 65 8D 25
C578: D8 04 8D 00 05 8D 28 05 A2
C580: 8D 50 05 8D 78 05 8D A0 9C
C588: 05 8D C8 05 8D F0 05 8D F9
C590: 18 06 8D 40 06 8D 68 06 7E
C598: 8D 90 06 8D B8 06 8D E0 77
C5A0: 06 8D 08 07 8D 30 07 8D 95
C5A8: 58 07 A9 67 8D DD 04 8D 16
C5B0: 05 05 8D 2D 05 8D 55 05 62
C5B8: 8D 7D 05 8D A5 05 8D CD 5C
C5C0: 05 8D F5 05 8D 1D 06 8D 8C
C5C8: 45 06 8D 6D 06 8D 95 06 3E
C5D0: 8D BD 06 8D E5 06 8D 0D 36
C5D8: 07 8D 35 07 8D 5D 07 A9 45
```

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C5E0: 5D 8D E3 04 8D 0B 05 8D DE
C5E8: 33 05 8D 5B 05 8D 83 05 25
C5F0: 8D AB 05 8D D3 05 8D FB 1F
C5F8: 05 8D 23 06 8D 4B 06 8D 21
C600: 73 06 8D 9B 06 8D C3 06 FF
C608: 8D EB 06 8D 13 07 8D 3B F7
C610: 07 8D 63 07 A2 6B 8E F8 A4
C618: 06 A2 73 8E F9 06 A9 0A 76
C620: 8D F8 DA 8D F9 DA AD 00 91
C628: DC C9 77 D0 23 AE B9 0B AD
C630: E8 8E 00 D0 8E B9 0B A9 75
C638: 82 8D A6 0F A9 01 8D A7 DD
C640: 0F AD A2 0F 8D BA 0B AD AF
C648: A3 0F 8D BB 0B 4C 7D C6 DF
C650: AD 00 DC C9 7B F0 03 4C 60
C658: 18 C7 AD A0 0F 8D BA 0B E8
C660: AD A1 0F 8D BB 0B A9 80 3D
C668: 8D A6 0F A9 01 8D A7 0F 9A
C670: AE B9 0B CA 8E 00 D0 8E 9C
C678: B9 0B 4C 7D C6 AD BC 0B 43
C680: C9 0D D0 03 4C 97 C6 AE 84
C688: BC 0B E8 8E BC 0B AD BA F7
C690: 0B 8D F8 07 4C B6 C6 AD A0
C698: BD 0B C9 0D D0 08 A9 0A C4
C6A0: 8D BC 0B 8D BD 0B AE BD B8
C6A8: 0B E8 8E BD 0B AD BB 0B 68
C6B0: 8D F8 07 4C B6 C6 AD B9 6F
C6B8: 0B C9 19 D0 20 AE B9 0B 0B
C6C0: E8 8E B9 0B A9 87 8D A0 5C
C6C8: 0F A9 88 8D A1 0F A9 89 7B
C6D0: 8D A2 0F A9 8A 8D A3 0F 84
C6D8: A9 00 8D A5 0F AD B9 0B 37
C6E0: C9 FF F0 03 4C 15 C7 AE 76
C6E8: A5 0F E0 01 F0 0C AE A4 CF
C6F0: 0F E8 8E A4 0F A9 01 8D 63
C6F8: A5 0F AE B9 0B CA 8E B9 34
C700: 0B A9 82 8D A2 0F A9 83 A3
C708: 8D A3 0F A9 80 8D A0 0F AF
C710: A9 81 8D A1 0F 4C 18 C7 A5
C718: A2 FF AC AD 0F CA D0 FD BD
C720: C8 D0 FA A5 C5 C9 3F F0 1A
C728: 03 4C 2F C7 4C D5 C3 AD 02
C730: BF 0B 8D 03 D0 AD C0 0B D5
C738: 8D 05 D0 AD C1 0B 8D 07 AA
C740: D0 AD C2 0B 8D 09 D0 AD A1
C748: C3 0B 8D 0B D0 A9 04 8D BB
C750: 28 D0 8D 29 D0 8D 2A D0 59
C758: 8D 2B D0 8D 2C D0 A9 0A 20
C760: 8D 2E D0 A9 E6 8D 02 D0 DD
C768: A9 33 8D 04 D0 A9 B9 8D 98
C770: 06 D0 A9 8C 8D 08 D0 A9 8D
C778: 5F 8D 0A D0 AE BE 0B 8E 47
C780: F9 07 8E FA 07 8E FB 07 A3
C788: 8E FC 07 8E FD 07 AE 1E 7B
C790: D0 8E CE 0B E0 42 D0 0F CC
C798: A9 00 8D C4 0B A9 F9 8D D0
C7A0: CD 0B A9 01 8D AA 0F AD 19
C7A8: C4 0B C9 01 F0 23 AD C4 C9
C7B0: 0B C9 00 F0 00 AD BF 0B EE
C7B8: C9 DD D0 08 A9 01 8D C4 36
C7C0: 0B 4C EA C7 AE BF 0B E8 2D
C7C8: 8E 03 D0 8E BF 0B 4C EA BB
C7D0: C7 AE BF 0B CA 8E 03 D0 3F
C7D8: 8E BF 0B AD BF 0B C9 52 C6
C7E0: F0 03 4C EA C7 A9 00 8D 0B
C7E8: C4 0B AE CE 0B E0 44 D0 37
C7F0: 0F A9 00 8D C5 0B A9 F9 AB
C7F8: 8D CD 0B A9 01 8D AA 0F 51
C800: AD C5 0B C9 01 F0 23 AD 0B
C808: C5 0B C9 00 F0 00 AD C0 02
C810: 0B C9 DD D0 08 A9 01 8D D3
C818: C5 0B 4C 43 C8 AE C0 0B BB
C820: E8 8E 05 D0 8E C0 0B 4C 14
C828: 43 C8 AE C0 0B CA 8E 05 0D
C830: D0 8E C0 0B AD C0 0B C9 9E
C838: 52 F0 03 4C 43 C8 A9 00 80
C840: 8D C5 0B AE CE 0B E0 48 50
C848: D0 0F A9 00 8D C6 0B A9 DA
C850: F9 8D CD 0B A9 01 8D AA 93
C858: 0F AD C6 0B C9 01 F0 23 C5
C860: AD C6 0B C9 00 F0 00 AD 48
C868: C1 0B C9 DD D0 08 A9 01 60
C870: 8D C6 0B 4C 9C C8 AE C1 F1
C878: 0B E8 8E C1 0B 8E 07 D0 2E
C880: 4C 9C C8 AE C1 0B CA 8E 07
C888: 07 D0 8E C1 0B AD C1 0B 36
C890: C9 52 F0 03 4C 9C C8 A9 FB
C898: 00 8D C6 0B AE CE 0B E0 61
C8A0: 50 D0 0F A9 00 8D C7 0B DA
C8A8: A9 F9 8D CD 0B A9 01 8D EA
C8B0: AA 0F AD C7 0B C9 01 F0 A6
C8B8: 23 AD C7 0B C9 00 F0 00 17
C8C0: AD C2 0B C9 DD D0 08 A9 66
C8C8: 01 8D C7 0B 4C F5 C8 AE E3
C8D0: C2 0B E8 8E C2 0B 8E 09 7B
C8D8: D0 4C F5 C8 AE C2 0B CA FB
C8E0: 8E 09 D0 8E C2 0B AD C2 16
C8E8: 0B C9 52 F0 03 4C F5 C8 0F
C8F0: A9 00 8D C7 0B AE CE 0B 83
C8F8: E0 60 D0 0F A9 00 8D C8 1A
C900: 0B A9 F9 8D CD 0B A9 01 BF
C908: 8D AA 0F AD C8 0B C9 01 9B
C910: F0 21 AD C8 0B C9 00 AD 1B
C918: C3 0B C9 DD D0 08 A9 01 12
C920: 8D C8 0B 4C 4C C9 AE C3 56
C928: 0B E8 8E C3 0B 8E 0B D0 E3
C930: 4C 4C C9 AE C3 0B CA 8E 69
C938: C3 0B 8E 0B D0 AD C3 0B ED
C940: C9 52 F0 03 4C 4C C9 A9 5C
C948: 00 8D C8 0B AC D1 0B C0 F3
C950: 01 D0 12 A9 00 8D D1 0B 48
C958: A9 0A 8D CD 0B 8D 0D D0 DD
C960: A6 A2 8E A8 0F AE CD 0B 77
C968: E8 8E CD 0B E0 FA F0 0C 91
C970: 8E 0D D0 AD A8 0F 8D 0C DB
C978: D0 4C 81 C9 A9 01 8D D1 EA
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C980: 0B AE C9 0B E8 8E C9 0B 5B
C988: E0 1E F0 03 4C A7 C9 A2 DB
C990: 0A 8E C9 0B AE BE 0B E0 57
C998: 85 F0 07 E8 8E BE 0B 4C A3
C9A0: A7 C9 A9 84 8D BE 0B AE 46
C9A8: B1 0F E0 01 F0 03 4C 47 D2
C9B0: CA A9 01 A0 00 8C 04 D4 2C
C9B8: 8C 0B D4 8C 12 D4 99 57 89
C9C0: D8 C8 C0 46 D0 F8 A9 00 DC
C9C8: A0 00 A9 31 8D 82 04 A9 02
C9D0: 32 8D 88 04 A9 33 8D 8E 16
C9D8: 04 B9 E9 C9 99 57 04 C8 08
C9E0: C0 13 D0 F5 A0 00 4C FC 65
C9E8: C9 03 08 0F 0F 13 05 20 14
C9F0: 0C 05 16 05 0C 20 10 0C 65
C9F8: 05 01 13 05 A4 C5 C0 38 7A
CA00: D0 08 A9 E9 8D AD 0F 4C 03
CA08: 22 CA C0 3B D0 08 A9 EE 62
CA10: 8D AD 0F 4C 22 CA C0 08 5C
CA18: D0 E2 A9 F7 8D AD 0F 4C 04
CA20: 22 CA A0 00 A9 0F 8D 18 0C
CA28: D4 A9 00 A2 82 8E A6 0F 10
CA30: A9 00 99 57 D8 C8 C0 46 73
CA38: D0 F8 A9 00 8D B1 0F A9 A3
CA40: 00 8D B3 0F 20 5F CD AE 8C
CA48: A4 0F E0 01 D0 1C A9 6B DF
CA50: 8D 8D 07 A9 73 8D 8E 07 B2
CA58: A9 0A 8D 8D DB 8D 8E DB FA
CA60: A9 31 8D 90 07 A9 01 8D 98
CA68: 90 DB E0 02 D0 17 A9 6B B4
CA70: 8D 65 07 A9 73 8D 66 07 82
CA78: A9 0A 8D 65 DB 8D 66 DB CA
CA80: A9 32 8D 90 07 E0 03 D0 36
CA88: 17 A9 6B 8D 3D 07 A9 73 A3
CA90: 8D 3E 07 A9 0A 8D 3D DB BD
CA98: 8D 3E DB A9 33 8D 90 07 42
CAA0: E0 04 D0 17 A9 6B 8D 15 25
CAA8: 07 A9 73 8D 16 07 A9 0A 2B
CAB0: 8D 15 DB 8D 16 DB A9 34 8C
CAB8: 8D 90 07 E0 05 D0 17 A9 55
CAC0: 6B 8D ED 06 A9 73 8D EE 47
CAC8: 06 A9 0A 8D ED DA 8D EE 55
CAD0: DA A9 35 8D 90 07 E0 06 96
CAD8: D0 17 A9 6B 8D C5 06 A9 D8
CAE0: 73 8D C6 06 A9 0A 8D C5 B5
CAE8: DA 8D C6 DA A9 36 8D 90 F0
CAF0: 07 E0 07 D0 17 A9 6B 8D 6A
CAF8: 9D 06 A9 73 8D 9E 06 A9 95
CB00: 0A 8D 9D DA 8D 9E DA A9 C0
CB08: 37 8D 90 07 E0 08 D0 17 35
CB10: A9 6B 8D 75 06 A9 73 8D D8
CB18: 76 06 A9 0A 8D 75 DA 8D B3
CB20: 76 DA A9 38 8D 90 07 E0 59
CB28: 09 D0 17 A9 6B 8D 4D 06 0F
CB30: A9 73 8D 4E 06 A9 0A 8D 70
CB38: 4D DA 8D 4E DA A9 39 8D 87
CB40: 90 07 E0 0A D0 26 A9 6B CE
CB48: 8D 25 06 A9 73 8D 26 06 D7
CB50: A9 0A 8D 25 DA 8D 26 DA 20
CB58: A9 31 8D 90 07 A9 30 8D BF
CB60: 91 07 A9 01 8D 91 DB A9 48
CB68: 01 8D AC 0F AE CE 0B E0 1C
CB70: 44 D0 03 4C 08 CC E0 42 CC
CB78: D0 03 4C 08 CC E0 50 D0 6F
CB80: 03 4C 08 CC E0 60 D0 03 B9
CB88: 4C 08 CC E0 48 D0 03 4C F2
CB90: 08 CC E0 C0 D0 03 4C 08 2F
CB98: CC E0 00 D0 03 4C 08 CC 3B
CBA0: E0 C2 D0 08 A9 01 8D AA FF
CBA8: 0F 4C 08 CC E0 41 D0 0D D8
CBB0: A2 00 8E A5 0F A9 01 8D CE
CBB8: AB 0F 4C DF CB A9 01 8D A3
CBC0: A5 0F A9 82 8D A2 0F A9 8A
CBC8: 83 8D A3 0F A9 80 8D A0 E4
CBD0: 0F A9 81 8D A1 0F AE A6 9E
CBD8: 0F 8E F8 07 4C 08 CC A9 41
CBE0: 0E 8D 27 D0 A9 1E 8D B9 83
CBE8: 0B 8D 00 D0 A9 0A 8D 27 BA
CBF0: D0 A9 82 8D F8 07 8D A2 AB
CBF8: 0F A9 83 8D A3 0F A9 80 9F
CC00: 8D A0 0F A9 81 8D A1 0F A6
CC08: AE A7 0F E0 01 F0 03 4C 8F
CC10: 3B CC AC A9 0F 88 8C A9 3C
CC18: 0F C0 00 D0 1E A9 00 8D 0E
CC20: A7 0F A9 04 8D 05 D4 A9 95
CC28: AA 8D 01 D4 A9 80 8D 04 F1
CC30: D4 A9 81 8D 04 D4 A9 08 48
CC38: 8D A9 0F AE AA 0F E0 01 C8
CC40: F0 03 4C 5E CC A9 04 8D E6
CC48: 0C D4 A9 64 8D 08 D4 A9 4B
CC50: 10 8D 0B D4 A9 11 8D 0B 21
CC58: D4 A9 00 8D AA 0F AE AB 78
CC60: 0F E0 01 F0 03 4C 6B CC C9
CC68: 4C D5 C3 AC AC 0F C0 01 78
CC70: F0 03 4C 26 C6 A9 81 8D 56
CC78: 15 D0 A9 02 8D AE D9 A9 C9
CC80: 53 8D AE 05 A9 82 8D F8 C7
CC88: 07 A9 82 8D 01 D0 A9 F3 B8
CC90: 8D 00 D0 A2 00 8E AE 0F DD
CC98: A9 F0 8D 14 D4 A9 11 8D F1
CCA0: 12 D4 AE AE 0F E8 8E AE 1A
CCA8: 0F 8E 0F D4 E0 00 F0 0A 06
CCB0: A0 64 88 C0 00 F0 EB 4C 28
CCB8: B2 CC AE AF 0F E8 E0 08 77
CCC0: 8E AF 0F F0 03 4C 93 CC AE
CCC8: 20 0F CD AE AD 0F E8 8E A8
CCD0: AD 0F A9 00 8D AC 0F 8D 0E
CCD8: A4 0F 8D A5 0F A2 00 A9 1B
CCE0: 1A 8D 00 D0 A9 D5 8D 01 67
CCE8: D0 A9 82 8D F8 07 A9 80 9D
CCF0: 8D A0 0F A9 81 8D A1 0F 97
CCF8: A9 82 8D A2 0F A9 83 8D 1F
CD00: A3 0F 20 5F CD AE B3 0F 71
CD08: E8 8E B3 0F 4C 35 C4 A9 32
CD10: 00 8D AF 0F A9 20 8D 8D 41
CD18: 07 8D 8E 07 8D 90 07 8D F4
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 99 and 100 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
CD20: 65 07 8D 66 07 8D 3D 07 59
CD28: 8D 3E 07 8D 15 07 8D 16 48
CD30: 07 8D ED 06 8D EE 06 8D C8
CD38: C5 06 8D C6 06 8D 9D 06 8F
CD40: 8D 9E 06 8D 75 06 8D 76 7F
CD48: 06 8D 4D 06 8D 4E 06 8D 9E
CD50: 25 06 8D 26 06 8D 90 07 5A
CD58: 8D 91 07 8D AE 05 60 A2 C2
CD60: 01 AD B3 0F C9 C8 90 0C 01
CD68: E9 C8 48 A9 32 8D D7 07 AB
CD70: 68 4C 82 CD 18 C9 64 90 4C
CD78: 09 E9 64 48 A9 31 8D D7 58
CD80: 07 68 18 A0 00 C9 0A 90 0D
CD88: 07 C8 E9 0A C9 0A B0 F9 CA
CD90: 48 98 69 30 8D D8 07 68 E0
CD98: 69 30 8D D9 07 60 00 FF 01
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HACKING
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STRING LOADER

```
·1 REM ----------------------                  FM
·2 REM  *** STRING LOADER ***                   AI
·3 REM     RUPERT REPORT #38                    OO
·4 REM          C-128                           KC
·5 REM (SEE ARTICLE FOR C-64)                   JD
·6 REM ----------------------                   FM
·1000 M=4892 :REM HEX $131C                     ND
·1010 READ B$                                   PE
·1020 IF B$="XX" THEN 1080                      BF
·1030 B=DEC(B$)                                 ID
·1040 CK=CK+B :REM CHECKSUM                     NE
·1050 POKE M,B                                  FF
·1060 M=M+1                                     CN
·1070 GOTO 1010                                 FB
·1080 IF CK<>4381 THEN PRINT"DATA ERROR"
 : STOP                                         PO
·1090 PRINT"STRING ROUTINE IS LOADED":END       BI
·1100 DATA 4C,24,13,41,48,4F,59,21              ED
·1110 DATA E0,00,F0,06,20,D2,FF,CA              HN
·1120 DATA D0,FA,C0,00,F0,09,20,D2              EF
·1130 DATA FF,CA,D0,FA,88,D0,F7,60              IC
·1140 DATA XX                                   DC
·2000 REM   * =====C-64 ONLY=======             KP
·2010 REM   REPLACE LINE 1030 WITH              MK
·2020 REM          GOSUB 2050                   MC
·2030 REM   (ALSO CHANGE LINE 1000)             CG
·2040 REM  --  C-64 HEX TO DECIMAL --           MI
·2050 H$=LEFT$(B$,1) : L$=RIGHT$(B$,1)          EP
·2060 H=ASC(H$)-48+7*(H$>"9")                   CK
·2070 L=ASC(L$)-48+7*(L$>"9")                   EO
·2080 B=16*H+L                                  GC
·2090 RETURN                                    IM
```

FLASHY WINDOWS

```
·1 REM ------------------------                 JL
·2 REM  *** FLASHY WINDOWS ***                  HE
·3 REM     RUPERT REPORT #38                    OO
·4 REM          C-128                           KC
·5 REM  MUST RUN "STRING LOADER"                AP
·6 REM  BEFORE THIS PROGRAM.                    LN
·7 REM ------------------------                 JL
·10 SCNCLR                                      OK
·20 PRINT"PRESS ANY KEY TO BEGIN OR TO EN
 D" : GETKEY A$                                 IN
·30 IF PEEK(4892)<>76 THEN PRINT"MUST RUN
 'STRING LOADER' FIRST" : STOP                  HD
·40 PRINT CHR$(27)"M" :REM STOP SCROLL          LL
·50 X=0 : Y=11 : S=1                            GI
·60 FOR W=X TO Y STEP S                         OI
·70 WINDOW W,W,39-W,24-W                        AO
·80 N=(40-2*W)*(25-2*W) :REM # OF CHAR'S.       IP
·90 CH=RND(0)*64+64      :REM CHAR. VALUE       HB
·100 GOSUB 160                                  CL
·105 REM ***** WHEN DONE, RESTORE SCROLL;
 HOME-HOME TO RESET WINDOW                      KB
·110 GET A$ : IF A$<>"" THEN PRINT CHR$(2
 7)"L"CHR$(19)CHR$(19); : END                   GA
·120 NEXT                                       IA
·130 IF X=11 THEN GOTO 50                       JO
·140 X=11 : Y=0 : S=-1                          BI
·150 GOTO 60                                    PG
·155 REM=== CALL STRING RTN. ===                FC
·160 MSB=INT(N/256)                             DP
·170 LSB=N-MSB*256                              NF
·180 SYS 4892,CH,LSB,MSB                        GC
·190 RETURN                                     IM
```

SCREEN FLASH

```
·1 REM ----------------------                   DC
·2 REM      SCREEN FLASH                        KK
·3 REM    RUPERT REPORT #38                     OO
·4 REM         C-64                             GN
·5 REM  MUST RUN MODIFIED                       BH
·6 REM 'STRING LOADER' FIRST.                   AH
·7 REM ----------------------                   FM
·10 IF PEEK(49153)<>8 THEN PRINT"MUST RUN
  MODIFIED STRING LOADER FIRST":STOP            OJ
·20 INPUT"PRESS ANY KEY AND RETURN TO BEG
 IN OR TO END";A$                               NI
·30 N=960                 :REM QUANTITY         AO
·40 Y=INT(N/256)          :REM MSB              CH
·50 X=N-Y*256             :REM LSB              FJ
·60 PRINT CHR$(147);                            JL
·70 POKE 781,X            :REM X REGISTER       HP
·80 POKE 782,Y            :REM Y REGISTER       JC
·90 CH=RND(0)*64+64       :REM CHARACTER        DA
·100 POKE 780,CH          :REM A REGISTER       DC
·110 SYS 49152                                  KF
```

```
•120 FOR P=1 TO 200:NEXT  :REM PAUSE        AB
•130 GET A$ : IF A$="" THEN GOTO 60         NC
```

WINDOW MAGIC
FROM PAGE 37

Starting address in hex: C000
Ending address in hex: CBE7
SYS to start: 49152
***Flankspeed* required for entry! See page 101.**

```
C000: AD 09 03 C9 C1 F0 38 A9 18
C008: 8F 8D 08 03 A9 C1 8D 09 32
C010: 03 A9 97 8D 04 03 A9 C0 53
C018: 8D 05 03 A9 5A 8D 06 03 48
C020: A9 C1 8D 07 03 A9 40 85 92
C028: A5 A9 C0 85 A6 A0 00 8C 91
C030: B9 02 8C B8 02 B1 A5 F0 7B
C038: 06 20 D2 FF C8 D0 F6 60 22
C040: 0D 0D 57 49 4E 44 4F 57 34
C048: 20 4D 41 47 49 43 20 49 34
C050: 4E 53 54 41 4C 4C 45 44 A9
C058: 21 0D 43 4F 50 59 52 49 5E
C060: 47 48 54 20 31 39 38 37 3E
C068: 20 42 59 20 49 4F 4E 20 4B
C070: 49 4E 54 45 52 4E 41 54 D7
C078: 49 4F 4E 41 4C 0D 00 00 F9
C080: 90 00 00 00 01 01 80 00 93
C088: 05 0B 0E 12 01 01 00 20 DA
C090: 28 28 9C DC 00 00 00 A6 01
C098: 7A A0 04 84 0F BD 00 02 0B
C0A0: 10 07 C9 FF F0 3E E8 D0 6A
C0A8: F4 C9 20 F0 37 85 08 C9 07
C0B0: 22 F0 55 24 0F 70 2D C9 B3
C0B8: 3F D0 04 A9 99 D0 25 C9 CF
C0C0: 30 90 04 C9 3C 90 1D 84 BD
C0C8: 71 A0 00 84 0B 88 86 7A F3
C0D0: CA C8 E8 BD 00 02 38 F9 3F
C0D8: 9E A0 F0 F5 C9 80 D0 2F 49
C0E0: 05 0B A4 71 E8 C8 99 FB 4E
C0E8: 01 C9 00 F0 38 38 E9 3A 39
C0F0: F0 04 C9 49 D0 02 85 0F 60
C0F8: 38 E9 55 D0 A0 85 08 BD 2D
C100: 00 02 F0 E0 C5 08 F0 DC 6F
C108: C8 99 FB 01 E8 D0 F0 A6 B8
C110: 7A E6 0B C8 B9 9D A0 10 4D
C118: FA B9 9E A0 D0 B5 F0 0F 92
C120: BD 00 02 10 BD 99 FD 01 46
C128: C6 7B A9 FF 85 7A 60 A0 15
C130: 00 B9 B6 C1 D0 02 C8 E8 E6
C138: BD 00 02 38 F9 B6 C1 F0 93
C140: F5 C9 80 D0 04 05 0B D0 36
C148: 99 A6 7A E6 0B C8 B9 B5 2D
C150: C1 10 FA B9 B6 C1 D0 E0 01
C158: F0 C6 10 0F 24 0F 30 0B 9D
C160: C9 FF F0 07 C9 CC B0 06 6F
C168: 4C 24 A7 4C F3 A6 38 E9 89
C170: CB AA 84 49 A0 FF CA F0 11
C178: 08 C8 B9 B6 C1 10 FA 30 B6
C180: F5 C8 B9 B6 C1 30 05 20 C6
C188: 47 AB D0 F5 4C EF A6 20 45
C190: 73 00 20 98 C1 4C AE A7 21
C198: C9 CC 90 04 C9 D8 90 06 FC
C1A0: 20 79 00 4C ED A7 38 E9 3E
C1A8: CC 0A AA BD F6 C1 48 BD A6
C1B0: F5 C1 48 4C 73 00 57 53 1B
C1B8: 49 5A C5 57 50 41 52 CD 2B
C1C0: 57 49 4E 44 4F D7 52 45 B2
C1C8: 53 45 D4 53 54 4F 52 C5 45
C1D0: 52 45 54 52 49 45 56 C5 B9
C1D8: 43 4C D7 53 43 52 4F 4C C4
C1E0: CC 4D 45 4E D5 42 4F D8 CE
C1E8: 44 49 53 50 4C 41 D9 43 C4
C1F0: 4F 4C 4F D2 00 84 C2 A8 9E
C1F8: C2 0C C2 3C C3 35 C2 2F B1
C200: C2 3B C2 41 C2 C1 C3 4C 96
C208: C2 57 C2 75 C3 20 79 00 B7
C210: F0 16 20 A9 C5 98 C9 03 0C
C218: F0 16 C9 02 F0 0F C9 01 B5
C220: D0 06 20 D0 C7 4C 68 C2 27
C228: A2 0B 4C 7D C2 4C 28 C3 9A
C230: 20 74 C8 4C 68 C2 20 1D 42
C238: C8 4C 68 C2 20 CD C2 4C 75
C240: 68 C2 20 79 00 F0 E1 20 F7
C248: 43 CA 4C 68 C2 20 2F C6 E3
C250: A0 01 8C B8 02 4C 68 C2 B0
C258: A0 01 8C BF 02 20 A9 C5 D7
C260: 20 D8 C8 A9 00 8D BF 02 1B
C268: 20 79 00 F0 0D C9 3A F0 F4
C270: 09 20 73 00 F0 04 C9 3A 06
C278: D0 F7 4C 79 00 A9 00 8D 3E
C280: BF 02 6C 00 03 A9 00 8D E8
C288: 96 C0 20 A9 C5 AD 83 C0 61
C290: D0 11 98 AC 96 C0 99 88 31
C298: C0 EE 96 C0 AD 96 C0 C9 6E
C2A0: 04 90 E7 20 C7 C4 4C 68 7E
C2A8: C2 A9 00 8D 96 C0 20 A9 C3
C2B0: C5 AD 83 C0 D0 11 98 AC 8F
C2B8: 96 C0 99 8C C0 EE 96 C0 3D
C2C0: AD 96 C0 C9 06 90 E7 20 2E
C2C8: C7 C4 4C 68 C2 EE 88 C0 05
C2D0: EE 89 C0 AE 8B C0 CA CA 9A
C2D8: 8E 8B C0 AE 8A C0 CA CA 43
C2E0: 8E 8A C0 AD 8E C0 48 AD AD
C2E8: 8F C0 8D 8E C0 AD 8C C0 11
C2F0: 48 A9 00 8D 8C C0 8D B8 04
C2F8: 02 AD 90 C0 48 A9 01 8D 7A
C300: 90 C0 20 2F C6 68 8D 90 ED
C308: C0 68 8D 8C C0 68 8D 8E 90
C310: C0 AE 8A C0 E8 E8 8E 8A B5
C318: C0 AE 8B C0 E8 E8 8E 8B BF
C320: C0 CE 89 C0 CE 88 C0 60 72
C328: 20 FB C4 20 1D C5 20 CD F9
C330: C2 20 A9 C5 20 D8 C8 20 64
C338: E5 C7 4C 68 C2 A9 9C 8D 31
C340: 92 C0 A9 DC 8D 93 C0 A0 9C
```

```
C348: 00 8C 7E C0 20 A9 C5 AD 51
C350: 83 C0 D0 1F C0 09 90 03 E1
C358: 4C D2 C3 8C 7E C0 AD 92 47
C360: C0 18 69 04 8D 92 C0 AD 35
C368: 93 C0 18 69 04 8D 93 C0 24
C370: 88 D0 EB 4C 68 C2 20 79 C6
C378: 00 D0 03 4C 28 C2 20 A9 4D
C380: C5 C0 10 B0 4D 8C 86 02 2A
C388: 20 A9 C5 AD 83 C0 D0 2F 0A
C390: C0 10 B0 3E 8C 20 D0 20 ED
C398: A9 C5 AD 83 C0 D0 20 C0 AB
C3A0: 10 B0 2F 8C 21 D0 A9 00 B8
C3A8: 85 A5 A9 D8 85 A6 A2 04 29
C3B0: A0 00 AD 86 02 91 A5 C8 87
C3B8: D0 FB E6 A6 CA D0 F6 4C F1
C3C0: 68 C2 20 FB C4 20 1D C5 CF
C3C8: 20 1D C8 20 A9 C5 88 98 7F
C3D0: D0 05 A2 0E 4C 7D C2 8D 71
C3D8: 87 C0 18 69 03 CD 8A C0 BE
C3E0: B0 F0 20 A9 C5 20 2F C6 28
C3E8: 20 D8 C8 A9 00 85 C6 85 26
C3F0: A5 AD 87 C0 85 A7 20 9C 76
C3F8: C4 20 90 C4 20 E4 FF F0 29
C400: FB C9 0D F0 57 C9 11 F0 E6
C408: 30 C9 91 D0 EF A4 A5 88 27
C410: 10 1A 20 93 C4 20 9C C4 34
C418: AC 87 C0 88 A9 11 20 D2 43
C420: FF 88 10 FA AD 87 C0 85 2F
C428: A5 4C F9 C3 84 A5 20 93 B5
C430: C4 A9 91 20 D2 FF 4C F9 69
C438: C3 A4 A5 C8 C4 A7 90 0F 1B
C440: F0 0D 20 93 C4 20 9C C4 38
C448: A9 00 85 A5 4C F9 C3 84 AB
C450: A5 20 93 C4 A9 11 20 D2 1C
C458: FF 4C F9 C3 20 8D C4 A9 7E
C460: 00 8D 0B DC 8D 09 DC 8D D6
C468: 08 DC AD 08 DC 20 E4 FF E4
C470: C9 4E F0 13 C9 59 F0 07 A7
C478: AD 09 DC C9 04 90 EE 20 79
C480: 93 C4 A5 A5 4C AC C4 20 02
C488: 93 C4 4C F9 C3 A9 2A 2C EA
C490: A9 BE 2C A9 20 AC 89 C0 E5
C498: C8 91 D1 60 AE 88 C0 E8 06
C4A0: E8 AC 89 C0 C8 C8 C8 18 F2
C4A8: 20 F0 FF 60 20 A9 C5 A9 53
C4B0: 00 A4 A5 C8 20 91 B3 A6 CF
C4B8: 47 A4 48 20 D4 BB 20 E5 A3
C4C0: C7 20 74 C8 4C 68 C2 18 75
C4C8: AD 88 C0 6D 8A C0 6D 8C 72
C4D0: C0 C9 1A B0 23 AD 89 C0 41
C4D8: 6D 8B C0 C9 29 B0 19 AD FC
C4E0: 8A C0 C9 02 90 12 AD 8B D3
C4E8: C0 C9 02 90 0B AD 8C C0 0C
C4F0: F0 05 AD 89 C0 F0 01 60 31
C4F8: 4C D2 C3 A2 00 B5 A5 9D 77
C500: A7 02 E8 E0 04 D0 F6 B5 F4
C508: 41 9D A7 02 E8 E0 08 D0 33
C510: F6 A5 14 9D A7 02 E8 A5 96
C518: 15 9D A7 02 60 A2 00 B5 2D
C520: D9 9D C0 02 09 80 95 D9 53
C528: E8 E0 19 D0 F2 38 20 F0 18
C530: FF 8E BB 02 8C BC 02 60 28
C538: 20 B3 EE CA D0 FA 60 A9 9B
C540: 00 85 A5 AD 88 02 85 A6 CF
C548: A9 00 85 A7 A9 D8 85 A8 CF
C550: AC 88 C0 C8 88 F0 09 20 B1
C558: 79 C5 20 85 C5 4C 54 C5 69
C560: 18 A5 A5 6D 89 C0 85 A5 A6
C568: 90 02 E6 A6 18 A5 A7 6D 5B
C570: 89 C0 85 A7 90 02 E6 A8 0A
C578: 60 18 A5 A5 69 28 85 A5 F8
C580: 90 02 E6 A6 60 18 A5 A7 66
C588: 69 28 85 A7 90 02 E6 A8 69
C590: 60 18 A5 45 69 28 85 45 50
C598: 90 02 E6 46 60 18 A5 47 BD
C5A0: 69 28 85 47 90 02 E6 48 C0
C5A8: 60 A0 00 8C 81 C0 8C 83 88
C5B0: C0 B1 7A C9 2C F0 09 C9 57
C5B8: 28 F0 05 C8 8C 83 C0 60 D0
C5C0: 20 73 00 B1 7A C9 22 D0 3D
C5C8: 32 20 73 00 A6 7A A4 7B CF
C5D0: 8E 7F C0 8C 80 C0 A0 FF 0E
C5D8: A2 00 C8 B1 7A C9 22 F0 4D
C5E0: 0C C9 00 F0 08 C9 3A F0 A4
C5E8: 04 E8 4C DA C5 8E 81 C0 93
C5F0: 20 73 00 F0 04 C9 3A D0 4E
C5F8: F7 38 60 C9 3A B0 08 20 66
C600: 9E AD 20 AA B1 18 60 20 61
C608: 8B B0 A5 0D F0 15 A0 00 9D
C610: B1 47 8D 81 C0 C8 B1 47 9A
C618: 8D 7F C0 C8 B1 47 8D 80 B5
C620: C0 38 60 A5 47 A4 48 20 73
C628: A2 BB 20 AA B1 18 60 A9 25
C630: 01 8D 94 C0 8D 95 C0 A9 A1
C638: 00 8D 82 C0 A9 00 8D BA FA
C640: 02 AD 94 C0 CD 8B C0 B0 10
C648: 06 EE 94 C0 EE BA 02 AD EB
C650: 95 C0 CD 8A C0 B0 06 EE 65
C658: 95 C0 EE BA 02 AD BA 02 C4
C660: F0 0F 20 72 C6 AE 90 C0 B9
C668: 20 38 C5 20 70 C7 4C 37 62
C670: C6 60 20 3F C5 A2 01 A0 01
C678: 00 E0 01 F0 66 38 8A ED 62
C680: 95 C0 C9 FF D0 05 A9 00 20
C688: 8D 82 C0 EC 95 C0 90 03 30
C690: 4C 2B C7 C0 00 F0 1C 38 D5
C698: 98 ED 94 C0 C9 FF F0 24 53
C6A0: AD 82 C0 D0 0A AD 8F C0 6A
C6A8: 91 A5 AD 8D C0 91 A7 C8 DD
C6B0: 4C 93 C6 AD 8E C0 D0 02 27
C6B8: A9 74 91 A5 AD 8D C0 91 9B
C6C0: A7 C8 D0 CF 88 AD 8F C0 58
C6C8: 91 A5 C8 AD 8E C0 D0 02 98
C6D0: A9 6A 91 A5 AD 8D C0 91 A9
C6D8: A7 E8 20 79 C5 20 85 C5 34
C6E0: 4C 77 C6 C0 00 F0 1B 38 70
```

```
C6E8: 98 ED 94 C0 C9 FF F0 23 A2
C6F0: AD 8E C0 D0 02 A9 77 91 73
C6F8: A5 AD 8D C0 91 A7 C8 4C E8
C700: E3 C6 AD 8E C0 D0 02 A9 24
C708: 4F 91 A5 AD 8D C0 91 A7 C3
C710: C8 D0 D0 AD 8E C0 D0 02 4A
C718: A9 50 91 A5 AD 8D C0 91 D6
C720: A7 E8 20 79 C5 20 85 C5 7B
C728: 4C 77 C6 C0 00 F0 1B 38 B7
C730: 98 ED 94 C0 C9 FF F0 23 E9
C738: AD 8E C0 D0 02 A9 6F 91 B2
C740: A5 AD 8D C0 91 A7 C8 4C 30
C748: 2B C7 AD 8E C0 D0 02 A9 B4
C750: 4C 91 A5 AD 8D C0 91 A7 09
C758: C8 D0 D0 AD 8E C0 D0 02 92
C760: A9 7A 91 A5 AD 8D C0 91 49
C768: A7 20 79 C5 20 85 C5 60 3B
C770: CE 94 C0 AD 8C C0 F0 54 D4
C778: 38 A5 A5 E9 01 85 45 A5 57
C780: A6 E9 00 85 46 38 A5 A7 62
C788: E9 01 85 47 A5 A8 E9 00 78
C790: 85 48 A0 00 B1 45 09 80 7F
C798: 91 45 A9 00 91 47 C8 CC 87
C7A0: 94 C0 90 F0 F0 EE 38 A5 35
C7A8: 45 E9 28 85 45 A5 46 E9 A0
C7B0: 00 85 46 38 A5 47 E9 28 B3
C7B8: 85 47 A5 48 E9 00 85 48 2B
C7C0: A0 00 B1 45 09 80 91 45 B8
C7C8: A9 00 91 47 EE 94 C0 60 EF
C7D0: 20 FB C4 20 1D C5 20 1D F1
C7D8: C8 EE B8 02 20 A9 C5 20 FA
C7E0: 2F C6 20 D8 C8 A2 00 BD F8
C7E8: A7 02 95 A5 E8 E0 04 D0 6C
C7F0: F6 BD A7 02 95 41 E8 E0 EF
C7F8: 08 D0 F6 BD A7 02 85 14 C9
C800: E8 BD A7 02 85 15 A2 00 8D
C808: BD C0 02 95 D9 E8 E0 19 DA
C810: D0 F6 18 AE BB 02 AC BC C5
C818: 02 20 F0 FF 60 AD 92 C0 8C
C820: C9 BC B0 12 18 69 04 8D 7C
C828: 92 C0 AD 93 C0 18 69 04 03
C830: 8D 93 C0 EE 7E C0 A9 00 E9
C838: 85 A5 AD 88 02 85 A6 A9 71
C840: 00 85 A7 AD 92 C0 85 A8 9C
C848: A9 00 85 45 A9 D8 85 46 0B
C850: A9 00 85 47 AD 93 C0 85 4E
C858: 48 A2 04 A0 00 B1 A5 91 D0
C860: A7 B1 45 91 47 C8 D0 F5 67
C868: E6 A6 E6 A8 E6 46 E6 48 E1
C870: CA D0 EA 60 AD 92 C0 C9 22
C878: A0 90 5C A9 00 AE 88 02 E8
C880: 85 A7 86 A8 A9 00 A2 D8 02
C888: 85 47 86 48 A9 00 AE 92 0F
C890: C0 85 A5 86 A6 AE 93 C0 AC
C898: 85 45 86 46 A2 04 A0 00 77
C8A0: 78 A9 34 85 01 B1 A5 91 66
C8A8: A7 B1 45 48 A9 37 85 01 F6
C8B0: 58 68 91 47 C8 D0 E9 E6 B4
C8B8: A6 E6 A8 E6 46 E6 48 CA 16
C8C0: D0 DE AD 92 C0 38 E9 04 97
C8C8: 8D 92 C0 AD 93 C0 38 E9 CD
C8D0: 04 8D 93 C0 CE 7E C0 60 25
C8D8: AE 8A C0 CA CA 8E 95 C0 4D
C8E0: AE 8B C0 CA CA CA 8E 94 5F
C8E8: C0 AD BF 02 F0 21 18 AD F0
C8F0: 88 C0 6D B8 02 AA AC 89 43
C8F8: C0 EE B8 02 20 E6 C9 AD E1
C900: B8 02 CD 95 C0 90 0B F0 6B
C908: 09 EE B7 02 4C 6F C9 20 5F
C910: E0 C9 A9 00 8D B7 02 AD 59
C918: 7F C0 85 A5 8D BD 02 AD 7E
C920: 80 C0 85 A6 8D BE 02 20 FB
C928: FA C9 AD B7 02 D0 08 AD DA
C930: BF 02 F0 04 4C 3D C9 60 9A
C938: A2 01 8E B8 02 A2 00 8E 56
C940: B9 02 AC B9 02 CC 94 C0 86
C948: B0 3A A0 00 B1 A5 C9 0D 02
C950: D0 07 A2 00 86 C7 4C BB 21
C958: C9 48 20 D2 FF AE 91 C0 5E
C960: 20 38 C5 68 C9 20 90 07 68
C968: C9 80 B0 03 EE B9 02 20 31
C970: 22 CA AD B7 02 F0 CB AD 2F
C978: BD 02 8D 7F C0 AD BE 02 74
C980: 8D 80 C0 60 A0 00 B1 A5 A7
C988: C9 20 F0 1F 90 09 C9 80 66
C990: B0 05 A9 9D 20 D2 FF 20 A0
C998: 0E CA CE B9 02 D0 E5 AE 61
C9A0: 94 C0 CA 20 22 CA CA D0 69
C9A8: FA F0 10 20 D2 FF A9 A0 E1
C9B0: EE B9 02 AC B9 02 CC 94 25
C9B8: C0 90 F0 A9 00 8D B9 02 ED
C9C0: AE B8 02 EC 95 C0 90 06 04
C9C8: EE B7 02 4C 6F C9 EE B8 9E
C9D0: 02 A6 C7 A9 0D 20 D2 FF EA
C9D8: 86 C7 20 ED C9 4C 6F C9 84
C9E0: AE 88 C0 AC 89 C0 E8 C8 81
C9E8: 18 20 F0 FF 60 38 20 F0 BB
C9F0: FF 18 AC 89 C0 C8 20 F0 D9
C9F8: FF 60 18 AD 7F C0 6D 81 4E
CA00: C0 85 A7 AD 80 C0 69 00 46
CA08: 85 A8 20 35 CA 60 38 A5 94
CA10: A5 E9 01 85 A5 8D 7F C0 99
CA18: A5 A6 E9 00 85 A6 8D 80 88
CA20: C0 60 18 A5 A5 69 01 85 94
CA28: A5 8D 7F C0 A5 A6 69 00 51
CA30: 85 A6 8D 80 C0 A5 A5 C5 3C
CA38: A7 A5 A6 E5 A8 90 03 EE 3D
CA40: B7 02 60 20 A9 C5 98 48 CA
CA48: 20 A9 C5 AD 83 C0 F0 02 BC
CA50: A0 01 8C 85 C0 68 C9 01 F7
CA58: 90 04 C9 05 90 03 4C D2 6E
CA60: C3 8D 84 C0 EE 88 C0 EE 1E
CA68: 89 C0 AE 8A C0 CA CA 8E D0
CA70: 8A C0 AE 8B C0 CA CA 8E DA
CA78: 8B C0 20 3F C5 AD 8A C0 E2
CA80: 8D 95 C0 AD 8B C0 8D 94 80
```

```
CA88: C0 AD 85 C0 F0 1C CE 85 9E
CA90: C0 AD 84 C0 C9 01 F0 29 29
CA98: C9 02 F0 74 C9 03 D0 03 6A
CAA0: 4C 36 CB C9 04 D0 03 4C DC
CAA8: 63 CB AE 8B C0 E8 E8 8E 33
CAB0: 8B C0 AE 8A C0 E8 E8 8E 57
CAB8: 8A C0 CE 88 C0 CE 89 C0 35
CAC0: 60 CE 95 C0 CE B8 02 A5 75
CAC8: A5 85 45 A5 A6 85 46 A5 F6
CAD0: A7 85 47 A5 A8 85 48 20 81
CAD8: 79 C5 20 85 C5 A2 00 A0 C6
CAE0: 00 B1 A5 91 45 B1 A7 91 F9
CAE8: 47 C8 CC 94 C0 D0 F2 20 FE
CAF0: 79 C5 20 85 C5 20 91 C5 13
CAF8: 20 9D C5 E8 EC 95 C0 D0 79
CB00: DE A9 20 A0 00 91 45 C8 E8
CB08: CC 94 C0 D0 F8 4C 7A CA 85
CB10: AE 95 C0 AC 94 C0 88 88 28
CB18: B1 A5 48 B1 A7 C8 91 A7 13
CB20: 68 91 A5 88 D0 F1 A9 20 D4
CB28: 91 A5 20 79 C5 20 85 C5 2A
CB30: CA D0 E0 4C 7A CA 20 8D EB
CB38: CB EE B8 02 AE 95 C0 CA 7D
CB40: AC 94 C0 88 B1 45 91 A5 F8
CB48: B1 47 91 A7 88 10 F5 20 29
CB50: B5 CB CA D0 EB AC 94 C0 5B
CB58: 88 A9 20 91 A5 88 10 FB 76
CB60: 4C 7A CA CE 94 C0 AE 95 5A
CB68: C0 A0 00 C8 B1 A5 48 B1 E3
CB70: A7 88 91 A7 68 91 A5 C8 42
CB78: CC 94 C0 D0 EE A9 20 91 B5
CB80: A5 20 79 C5 20 85 C5 CA BB
CB88: D0 DF 4C 7A CA AE 95 C0 CF
CB90: CA 20 79 C5 20 85 C5 CA F0
CB98: D0 F7 38 A5 A5 E9 28 85 7C
CBA0: 45 A5 A6 E9 00 85 46 38 20
CBA8: A5 A7 E9 28 85 47 A5 A8 23
CBB0: E9 00 85 48 60 38 A5 A5 4C
CBB8: E9 28 85 A5 B0 02 C6 A6 16
CBC0: 38 A5 A7 E9 28 85 A7 B0 36
CBC8: 02 C6 A8 38 A5 45 E9 28 6F
CBD0: 85 45 B0 02 C6 46 38 A5 39
CBD8: 47 E9 28 85 47 B0 02 C6 78
CBE0: 48 60 F0 0F F0 0F F0 0F 89
```

WINDOW MAKER DEMO

```
·100 PRINT "[CLEAR]";CHR$(8)                       AH
·110 COLOR(11,5,13): RESET                          HH
·120 CR$=CHR$(13):FOR CT=1 TO 2                     BC
·140 PRINT "[4" "][RVSON] [RVSOFF][3" "][
RVSON] [RVSOFF] [RVSON][3" "][RVSOFF] [R
VSON] [RVSOFF][3" "][RVSON] [RVSOFF] [RV
SON][3" "][c *][RVSOFF] [RVSON][sEP]  [c
 *][RVSOFF] [RVSON] [RVSOFF][3" "][RVSON
] [RVSOFF]"                                         IE
·150 PRINT "[4" "][RVSON] [RVSOFF][3" "][
RVSON] [RVSOFF]  [RVSON] [RVSOFF]  [RVSO
N] [c *][RVSOFF]  [RVSON] [RVSOFF] [RVSO
N] [RVSOFF]  [RVSON] [RVSOFF] [RVSON] [R
VSOFF]  [RVSON] [RVSOFF] [RVSON] [RVSOFF
][3" "][RVSON] [RVSOFF]"                            KC
·160 PRINT "[4" "][RVSON] [sEP] [c *] [RV
SOFF]  [RVSON] [RVSOFF]  [RVSON] [RVSOFF
][c *][RVSON][c *][RVSOFF] [RVSON] [RVSO
FF] [RVSON] [RVSOFF]  [RVSON] [RVSOFF] [
RVSON] [RVSOFF]  [RVSON] [RVSOFF] [RVSON
] [sEP] [c *] [RVSOFF]"                             JE
·170 PRINT "[4" "][RVSON] [RVSOFF][sEP] [
c *][RVSON] [RVSOFF]  [RVSON] [RVSOFF]
[RVSON] [RVSOFF] [c *][RVSON][c *] [RVSO
FF] [RVSON] [RVSOFF]  [RVSON] [RVSOFF] [
RVSON] [RVSOFF]  [RVSON] [RVSOFF] [RVSON
] [RVSOFF][sEP] [c *][RVSON] [RVSOFF]"              OM
·180 PRINT "[4" "][sEP][3" "][c *] [RVSON
][3" "][RVSOFF] [RVSON] [RVSOFF]  [c *][
RVSON] [RVSOFF] [RVSON][3" "][RVSOFF][sE
P] [c *][RVSON]  [RVSOFF][sEP] [sEP][3"
"][c *]"                                            HI
·200 PRINT:PRINT "[8" "][RVSON][c *][RVSO
FF][3" "][RVSON][sEP][RVSOFF] [RVSON][sE
P]  [c *][RVSOFF] [RVSON][sEP][3" "][RVS
OFF] [RVSON][3" "][RVSOFF] [RVSON][sEP][
3" "][RVSOFF]"                                      CG
·210 PRINT "[8" "][RVSON] [c *][RVSOFF] [
RVSON][sEP] [RVSOFF] [RVSON] [RVSOFF]  [
RVSON] [RVSOFF] [RVSON] [RVSOFF][5" "][R
VSON] [RVSOFF]  [RVSON] [RVSOFF]"                   FL
·220 PRINT "[8" "][RVSON] [RVSOFF][c *][R
VSON] [RVSOFF][sEP][RVSON] [RVSOFF] [RVS
ON][4" "][RVSOFF] [RVSON] [RVSOFF] [RVSO
N] [c *][RVSOFF]  [RVSON] [RVSOFF]  [RVS
ON] [RVSOFF]"                                       FF
·230 PRINT "[8" "][RVSON] [RVSOFF][3" "][
RVSON] [RVSOFF] [RVSON] [RVSOFF]  [RVSON
] [RVSOFF] [RVSON] [RVSOFF]  [RVSON] [RV
SOFF]  [RVSON] [RVSOFF]  [RVSON] [RVSOFF
]"                                                  PH
·240 PRINT "[8" "][RVSON] [RVSOFF][3" "][
RVSON] [RVSOFF] [RVSON] [RVSOFF]  [RVSON
] [RVSOFF] [c *][RVSON]  [RVSOFF][sEP] [
RVSON][3" "][RVSOFF] [c *][RVSON][3" "][
RVSOFF]"                                            OO
·250 IF CT=1 THEN: COLOR(2): PRINT                 PJ
·260 NEXT CT: PRINT"[HOME]"                         FB
·270 A$="[RVSON][BLUE][3" "][3"*"][RED] W
INDOW MAGIC [BLUE][3"*"]"+CR$+CR$+"[RVSO
N][11" "]BY"                                        KH
·280 A$=A$+CR$+"[RVSON][5" "]RICHARD F. D
ALEY"+CR$+"[RVSON][10" "]AND"+CR$                   LA
·290 A$=A$+"[RVSON][6" "]SALLY J. DALEY"+
CR$+CR$                                             EL
·300 A$=A$+"[RVSON] COPYRIGHT 1986[RVSOFF
]"                                                  PK
·310 WSIZE(4,6,10,28): WPARM(0,6,160,160,
40,10)                                              OB
```

```
•320 FOR CT=0 TO 1000: NEXT: WINDOW(1,A$) GF
•330 FOR CT=0 TO 2000: NEXT: WPARM(1,0,0,
 32): WSIZE(11,19,7,9)                    CH
•340 A$="[BLACK]PRESS THE SPACE BAR TO BE
 GIN THE DEMO"                            HO
•350 WINDOW(1,A$)                         NE
•360 GET T$: IF T$<>" " THEN 360          FI
•370 RESET(1): RETRIEVE                   GI
•380 A$="[BLUE]IN THE FOLLOWING SCREENS,
 PRESS THE SPACE BAR"                     EC
•390 A$=A$+" WHEN YOU WISH TO CONTINUE."  IC
•400 WPARM (0): WSIZE(4,4,14,12)          KL
•410 WINDOW(1,A$)                         NE
•420 GET T$: IF T$<>" " THEN 420          FN
•430 A$="[BLACK]WINDOW MAGIC[RED] ADDS 11
  COMMANDS TO BASIC. THESE 11 COMMANDS "  HJ
•440 A$=A$+"ALLOW YOU TO OPEN AND CLOSE W
 INDOWS, PRINT MESSAGES IN A WINDOW"      GK
•450 A$=A$+", AND SET WINDOW SIZE, COLOR
 AND OTHER PARAMETERS."                   GA
•460 WPARM(0,2): WSIZE(8,12,12,24)        EG
•470 WINDOW(1,A$)                         NE
•480 GET T$: IF T$<>" " THEN 480          FH
•490 A$="YOU'LL BE AMAZED AT THE POWER OF
  [BLACK]WINDOW MAGIC[RED] AND THE PROFES
 SIONAL"                                  AG
•500 A$=A$+" APPEARANCE OF THE PROGRAMS Y
 OU WRITE USING [BLACK]WINDOW MAGIC[RED].
 "                                        NF
•510 WPARM(0,6): WSIZE(3,6,14,16): WINDOW
 (1,A$)                                   MK
•520 GET T$: IF T$<>" " THEN 520          HO
•530 A$="AS YOU CAN SEE YOU CAN USE ANY C
 HARACTER YOU WISH FOR A BORDER."         EC
•540 A$=A$+CR$+CR$+"DID YOUR C-64 EVER LO
 OK SO GOOD?"                             LM
•550 WPARM(0,1,42,32,50,50): WSIZE(4,26,1
 5,12)                                    PN
•560 WINDOW(1,A$)                         NE
•570 GET T$: IF T$<>" " THEN 570          HL
•580 A$="[RVSON][c 2]YOU HAVE COMPLETE CO
 NTROL OVER THE SPEED USED IN OPENING A W
 INDOW."                                  KK
•590 WPARM(0,9,160,160,255,50): WSIZE(7,2
 ,9,15)                                   PJ
•600 WINDOW(1,A$)                         NE
•610 GET T$: IF T$<>" " THEN 610          HO
•620 A$="[RVSON]AND THE PRINTING SPEED CA
 N BE FAST[3"."]"                         II
•630 WPARM(0,9,160,160,50,1): WINDOW(2,A$
 )                                        LO
•640 FOR CT=0 TO 500: NEXT                PC
•650 A$=CR$+"[RVSON]OR SL[3"O"]W[3"."]"   HO
•660 WPARM(0,2,160,160,50,255): DISPLAY(A
 $)                                       NO
•670 GET T$: IF T$<>" " THEN 670          HI
•680 A$="[BLACK][RVSOFF]AND HOW ABOUT THI
 S EFFECT? THE WINDOW HAS A THREE DIMENSI
 ONAL"                                    DN
•690 A$=A$+" APPEARANCE."                 IG
•700 WPARM(1,8,0,32,50,50): WSIZE(12,14,1
 0,14)                                    OC
•710 WINDOW(1,A$)                         NE
•720 GET T$: IF T$<>" " THEN 720          GA
•730 A$="NOW WATCH THIS ONE[3"."]PRESS TH
 E SPACE BAR SLOWLY 7 TIMES."             NP
•740 WPARM(0,0): WSIZE(0,0,25,40)         JF
•750 WINDOW(1,A$)                         NE
•760 GET T$: IF T$=" " THEN 760           KE
•770 FOR CT=1 TO 7                        NF
•780 GET T$: IF T$<>" " THEN 780          HK
•790 WINDOW(3):NEXT                       BA
•810 FOR CT=1 TO 1000: NEXT               CF
•820 A$="ANOTHER FUN COMMAND IS 'SCROLL'.
  TO WATCH THIS PRESS THE"                GA
•830 A$=A$+" NUMBER KEYS 1 TO 4. WHEN FIN
 ISHED PRESS THE SPACE BAR."              PM
•840 RESET: WSIZE(7,4,15,15): WPARM(1,2,0
 ,32,40,10)                               KP
•850 WINDOW(1,A$)                         NE
•860 GET T$: IF T$=" " THEN 910           NP
•870 DR=VAL(T$): IF DR<1 OR DR>4 THEN 860 PO
•880 FOR CT=1 TO 13: SCROLL(DR,1): NEXT C
 T                                        NE
•890 WINDOW(2,A$)                         PP
•900 GOTO 860                             CO
•910 WINDOW(3)                            FF
•920 A$="NOW WE'LL LOOK AT THE MENU COMMA
 ND. THIS COMMAND WILL ALLOW YOU TO"      MG
•930 A$=A$+" PREPARE A MENU IN A WINDOW A
 ND EASILY SELECT"                        LK
•940 A$=A$+" ONE OF THE ITEMS ON THAT MEN
 U."                                      AF
•950 WSIZE(6,7,16,20): WINDOW(1,A$)       BP
•960 GET T$: IF T$<>" " THEN 960          HO
•970 A$="[5" "]MENU"+CR$+" TO SELECT ONE
 OF"+CR$                                  DP
•980 A$=A$+" THE MENU ITEMS,"+CR$+" USE T
 HE CURSOR"+CR$                           CO
•990 A$=A$+" UP AND DOWN"+CR$+" KEYS TO M
 OVE"+CR$                                 KJ
•1000 A$=A$+" THE MARKER UP OR"+CR$+" DOW
 N. PRESS"+CR$                            FF
•1010 A$=A$+" RETURN WHEN"+CR$+" THE CORR
 ECT"+CR$                                 PA
•1020 A$=A$+" ENTRY IS MARKED."+CR$+" THE
  ASTERISK"+CR$                           GM
•1030 A$=A$+" WILL REMAIN FOR"+CR$+" FOUR
  SECONDS."+CR$                           GH
•1040 A$=A$+" PRESS 'Y' OR"+CR$+" OR 'N'
 TO"+CR$                                  NP
•1050 A$=A$+" STOP THE DELAY."            IM
•1060 WPARM(1,0,0): WSIZE(1,12,19,21)     KD
•1070 MENU(16,A$,SL)                      PN
•1080 WPARM(0,11,0,32,50,50): WSIZE(16,9,
 5,20)                                    OA
```

```
1090 A$="YOU SELECTED ENTRY NUMBER"+STR$(SL)+" ON THE MENU."   MG
1100 WINDOW(1,A$)   NE
1110 GET T$: IF T$<>" " THEN 1110   HN
1120 RESET(1): RETRIEVE   GI
1130 A$="[RED]THIS DEMONSTRATION DOES NOT INCLUDE ALL OF THE [BLACK]WINDOW MAGIC[RED] "   MH
1140 A$=A$+"COMMANDS. NOT SPECIFICALLY DEMONSTRATED ARE THE"   CE
1150 A$=A$+" 'BOX', 'CLW', AND 'STORE' COMMANDS."   DB
1160 A$=A$+CR$+CR$+"STUDY THE THIS PROGRAM FOR MORE "   BH
1170 A$=A$+"DETAILS ON MAKING"   CA
1180 FOR CT=1 TO 1000: NEXT   CF
1190 WPARM(1,6,0): WSIZE(5,4,13,31)   LF
1200 WINDOW(1,A$)   NE
1210 A$="[BLACK]WINDOW MAGIC[RED] WORK. PRESS SPACE TO END THE DEMO."   HJ
1220 DISPLAY(A$)   IM
1230 GET T$: IF T$<>" " THEN 1230   HM
1240 WINDOW(3): PRINT "[HOME]";CHR$(8):END   KD
```

MORE BASIC 128

FROM PAGE 96

BOOTER & MENU

```
110 OPEN233,3:CMD233:REM DOUBLE SPACING   EM
120 PRINT"[CLEAR][DOWN]","[RVSON]MORE BASIC 128"   KE
130 PRINT".DLIST[3" "]LIST BASIC FILE"   DJ
140 PRINT".DREAD[3" "]LIST SEQUENTIAL FILE"   AK
150 PRINT".DABS[4" "]FILE START ADDRESS"   ED
160 PRINT".SEND[4" "]SEND COMMAND TO DOS"   PJ
170 PRINT".VHELP[3" "]DISPLAY VARIABLES"   PB
180 PRINT".USTOP[3" "]DISABLE UTILITY"   HL
190 PRINT"SYS5959  RE-ENABLE UTILITY"   GE
200 PRINT#233:CLOSE3   EI
210 BLOAD"MORE BASIC.ML":SYS5959:END   EL
```

CREATOR

```
100 REM* MORE BASIC.CRE FROM AHOY!!   DH
110 REM* (C)REATED  BY  --SHAWN K. SMITH   KD
120 PRINT:PRINT:PRINT"ONE MOMENT PLEASE!   HM
130 BANK15:FORD=5959TO6495:READY$   IO
140 C=DEC(Y$):T=T+C:POKED,C:NEXT:PRINT   GK
150 POKE243,9:IFT=59419THEN180   PH
160 PRINT"CHECKSUM ERROR- ";   CE
170 PRINT"RECHECK DATA LINES[4"!"]":END   OB
180 INPUT"PRESS 'RETURN' TO SAVE";A$   LK
190 BSAVE"MORE BASIC.ML",P5959 TO P6495   CB
200 DATA AD,00,03,AE,01,03,8D,5E,19,8E   KE
210 DATA 5F,19,A9,66,A2,17,8D,00,03,8E   MB
220 DATA 01,03,60,AD,5E,19,AE,5F,19,D0   OJ
230 DATA F1,E0,0B,F0,03,6C,5E,19,20,86   HJ
240 DATA 03,C9,2E,D0,F6,20,80,03,20,80   MG
250 DATA 03,A0,05,D9,58,19,F0,05,88,10   CI
260 DATA F8,30,E4,68,68,98,AA,0A,85,DB   DK
270 DATA 20,80,03,E0,04,B0,03,20,16,18   LI
280 DATA A4,DB,B9,4D,19,48,B9,4C,19,48   NB
290 DATA 60,20,CF,FF,AA,20,B7,FF,D0,0D   NF
300 DATA 20,B3,17,D0,08,8A,18,60,A5,D3   OJ
310 DATA 29,04,60,20,14,A1,38,60,20,A2   FD
320 DATA 17,B0,FA,20,D2,FF,4C,BD,17,A0   BA
330 DATA 00,A2,0C,84,61,86,62,20,A2,17   PB
340 DATA B0,E7,20,A2,17,B0,E2,20,A2,17   DA
350 DATA 99,00,0C,B0,DA,C8,C0,04,D0,F3   EK
360 DATA 20,A2,17,99,00,0C,B0,CD,F0,03   CP
370 DATA C8,D0,F3,AD,03,0C,AE,02,0C,20   JL
380 DATA 23,51,20,CE,A2,A0,00,F0,D6,A0   MP
390 DATA 01,20,A2,17,96,64,B0,AF,88,10   OE
400 DATA F6,20,B8,17,4C,36,8E,20,B8,17   CI
410 DATA A0,0D,B9,4B,18,99,70,02,88,10   JG
420 DATA F7,20,70,02,A6,24,20,BD,FF,A9   JA
430 DATA 00,A2,08,A4,DB,C0,06,D0,02,A0   CD
440 DATA 0F,20,BA,FF,20,C0,FF,A2,00,20   FA
450 DATA C6,FF,90,05,68,68,4C,B8,17,60   LD
460 DATA 20,7B,87,A2,00,86,7A,8E,00,FF   CB
470 DATA E8,4C,68,FF,A5,2F,A6,30,85,AC   BE
480 DATA 86,AD,D0,0B,A5,AC,18,69,07,85   CM
490 DATA AC,90,02,E6,AD,A5,AC,C5,31,A5   IM
500 DATA AD,E5,32,B0,0B,20,B3,17,D0,06   GM
510 DATA 20,84,18,4C,63,18,60,A0,07,A2   GI
520 DATA 01,A9,AC,20,D0,F7,99,03,00,88   JE
530 DATA 10,F3,20,B4,B8,A5,03,29,7F,20   EG
540 DATA D2,FF,A5,04,29,7F,20,D2,FF,24   LJ
550 DATA 04,30,24,A9,3D,20,D2,FF,A5,AC   CJ
560 DATA A4,AD,18,69,02,90,01,C8,20,B4   MM
570 DATA 8A,20,28,8C,20,42,8E,A8,B9,00   EK
580 DATA 01,F0,BD,20,D2,FF,C8,D0,F5,24   PM
590 DATA 03,10,0D,20,7D,FF,25,3D,00,A5   FG
600 DATA 05,A6,06,4C,32,8E,20,7D,FF,24   KD
610 DATA 3D,00,A5,05,D0,07,20,7D,FF,22   CH
620 DATA 22,00,60,A0,FF,A2,07,86,79,C8   FF
630 DATA A2,01,A9,06,20,D0,F7,48,A2,04   LD
640 DATA DD,A3,61,F0,2E,CA,D0,F8,C9,14   KA
650 DATA F0,27,A6,79,E0,08,90,07,D0,0A   CF
660 DATA A9,2B,20,69,92,A9,22,20,69,92   MJ
670 DATA 68,20,69,92,A2,09,C6,05,D0,CB   AE
680 DATA E0,09,90,C2,A9,22,20,69,92,D0   NJ
690 DATA BB,A6,79,BD,9A,61,20,69,92,CA   BL
700 DATA E0,03,B0,F5,68,20,30,A8,A9,29   NB
710 DATA 20,69,92,A2,08,D0,D7,C7,17,BC   BA
720 DATA 17,03,18,B7,17,58,18,5D,17,9B   FK
730 DATA 87,B6,80,EA,90,3F,4D,48   PH
```

USER CONVENTIONS FROM PAGE 74

USER BOOT

```
•10 REM USER BOOT                                    BC
•20 REM                                              JD
•30 POKE53281,0:POKE53280,0                          ED
•40 INPUT"[CLEAR][c 5][4"[DOWN]"][3"[RIGH
T]"] DEVICE NUMBER 8[3"[LEFT]"]";C$:DV=V
AL(C$):IFDV<8ORDV>9GOTO40                            FL
•50 POKE49178,DV                                     FO
•60 PRINT"[CLEAR][4"[DOWN]"]POKE43,1:POKE
44,16:POKE4096,0:CLR[3"[DOWN]"]"                     DH
•70 PRINT"LOAD"CHR$(34)"USER CONV*"CHR$(3
4)","DV"[4"[DOWN]"]"                                 CK
•80 PRINT"RUN[HOME][DOWN]"                           PF
•90 FORX=631TO640:POKEX,13:NEXT:POKE198,1
0:END                                                MN
```

USER CONVENTIONS

```
•1 IFR=.THENR=1:V=PEEK(49178):Z=53265:I=.
:GOSUB10:PRINT"[CLEAR]"CHR$(8):LOAD"ALL
ML*",V,R                                             LK
•2 GOSUB11:O=214:D=.:TC=49799:B=49625:KB=
198:U=42:Q=212:X=.:W=646                             HF
•3 POKE49178,V:N=1753:T=49591:S=54272:S$=
CHR$(15):Z$=CHR$(16):R$=CHR$(13):F7$="CM
DR-"                                                 BF
•4 G$="[s C]":J$="[s D]":P$="[s F]":E$="D
ESCRIPTION":F1$="CTRL-":F3$="SHFT-":D$="
DELETED                                              JM
•5 SQ$="[5"*"]":SR$=SQ$+SQ$:W$="MAGAZINE:
 ":V$="TO CONTINUE":A$="[RVSON]'*' TO ES
CAPE                                                 ML
•6 B$="[CNTRL N]":Q$="[s G]":O$="[s E]":F
5$="FCTN-":N$="CONT.":TP$="[HOME][4"[DOW
N]"]":PR$="PROGRAM NAME: "                           NO
•7 SP$="[5" "]":FORD=STOS+23:POKED,.:NEXT
:POKES+5,112:POKES+6,115:POKES+24,15                 PE
•8 SYS49655:DIMT$(100,R):GOTO27                      NF
•9 E=LEN(U$):C$=LEFT$(U$,R):H$=RIGHT$(U$,
R):RETURN                                            BB
•10 POKEZ,PEEK(Z)AND239:RETURN                       LB
•11 POKEZ,PEEK(Z)OR16:RETURN                         JG
•12 PRINT"[RVSON]"SR$SR$SR$SQ$"[3"*"]":RE
TURN                                                 MK
•13 GOSUB15:POKEKB,.:INPUT"[HOME][DOWN][D
OWN][RVSON] CONFIRM  Y[3"[LEFT]"]";C$:C$
=LEFT$(C$,1):RETURN                                  JB
•14 SYST:SYSB:PRINTTP$"[RVSON]";                     EL
•15 POKEW,PEEK(TC)AND15:FORD=217TO242:POK
ED,PEEK(D)OR128:NEXT:RETURN                          DL
•16 X=X+R:IFT$(X,.)=N$THENK$=K$+T$(X,R):G
OTO16                                                EN
•17 RETURN                                           IM
•18 SYSB:POKEO,8:PRINTR$" KEY: "R$R$:POKE
O,3:PRINTSPC(29)"[DOWN][RVSON][c 3]ESCAP
E"                                                   OA
•19 GETH$:H=ASC(H$+CHR$(.)):IFH=UORK=137T
HENRETURN                                            BH
•20 IFH<133ORH>136GOTO19                             GG
•21 SYSB:X$="[DOWN] KEY: ":C=5:L=R:GOSUB1
76:IFK=UTHENRETURN                                   HJ
•22 U$=LEFT$(U$+SP$,5):ONH-132GOTO24,25,2
6                                                    OF
•23 F7$=U$:RETURN                                    IL
•24 F1$=U$:RETURN                                    JN
•25 F3$=U$:RETURN                                    KH
•26 F5$=U$:RETURN                                    JB
•27 M$="":SYST:GOSUB15:SYS49636:POKEKB,.             HC
•28 GETH$:H=ASC(H$+CHR$(.)):IFH<133ORH>14
0GOTO28                                              HL
•29 ONH-132GOTO33,93,92                              EL
•30 IFH<140GOTO61                                    AH
•31 BC=PEEK(TC)+R:IFBC=16THENBC=2                    CA
•32 POKETC,BC:SYS49604:GOTO28                        MP
•33 I=R                                              EI
•34 FORMN=.TORSTEP.                                  MP
•35 SYST:GOSUB15:PRINT"[HOME][3"[DOWN]"][
RIGHT][c 7]";:GOSUB12:PRINT"[RIGHT][RVSO
N]* [c 8]F1[c 7] "F1$"[4" "][c 8]F5[c 7]
 "F5$;                                               FC
•36 PRINT"[3" "][c 8]F2[c 7] UNUSED[3" "]
*"R$"[RIGHT][RVSON]* [c 8]F3[c 7] "F3$"[
4" "][c 8]F7[c 7] "F7$"[3" "][c 8]F4[c 7
] REDEFINE *";                                       IJ
•37 PRINTR$"[RVSON][RIGHT]";:GOSUB12:IFM$
="M"GOTO40                                           IA
•38 SYSB:POKEO,19:PRINT"[DOWN] [c 4]";:GO
SUB12:PRINT" [RVSON]* [c 5]F6[c 4] WRITE
 FILE"SP$SP$SP$SP$"  *                               EF
•39 PRINT" [RVSON]* [c 5]F8[c 4] ABORT EN
TRY SESSION [DATA LOST] *"R$" [RVSON]";:
GOSUB12                                              JE
•40 A=.:C=28:L=R:X$="[DOWN][c 8] COMMAND:
[c 7]":GOSUB172:IFM$="M"THENRETURN                   LC
•41 IFU$=N$GOTO40                                    BF
•42 IFK<139GOTO45                                    AO
•43 MN=R:IFK=139ANDI>RTHENI=I-R:GOTO52               PJ
•44 NEXT:GOTO27                                      LC
•45 IFK=138THENGOSUB18:GOTO35                        OO
•46 IFU$=N$THENA=A+R:IFA=3GOTO35                     EI
•47 T$(I,.)=U$:IFU$<>N$THENSYST:GOSUB225             DC
•48 SYSB:POKEO,19:PRINTR$"[c 4] ";:GOSUB1
2:PRINT" [RVSON]*  HIT RETURN OVER '[UPA
RROW]' "V$"[3" "]*                                   HM
•49 PRINT" [RVSON]*  "E$SP$SP$"TWICE MAX.
[3" "]*"R$" ";:GOSUB12:GOSUB15                       JD
•50 X$="[DOWN][c 8] "+E$+": [c 7]":C=80:L
=R:GOSUB172:T$(I,R)=U$:SYSB:IFM$="M"THEN
RETURN                                               DE
•51 I=I+R:IFC$="[UPARROW]"THENU$=N$:GOSUB
15:PRINT"[HOME][DOWN][DOWN][RIGHT][RVSON
```

```
]"N$A+R:GOTO46                                PN
·52 NEXT:IFM$="A"GOTO60                       OL
·53 GOSUB156:IFK=UGOTO27                      FN
·54 PRINTTP$"[RVSON] CHECKING FILE[3"."]"
 :GOSUB206:IFE<>62THENGOSUB98:GOTO53          OM
·55 X$=W$:C=16:L=R:GOSUB157:IFK=UGOTO27       GD
·56 MA$=FP$:X$="MONTH: ":C=3:L=C:GOSUB157
 :IFK=UGOTO27                                 NB
·57 MO$=FP$:X$="YEAR: ":C=4:L=C:GOSUB157:
 IFK=UGOTO27                                  JM
·58 YR$=FP$:MO$=MO$+" "+YR$:X$="PAGE: ":L
 =R:GOSUB157:IFK=UGOTO27                      GJ
·59 PA$=RIGHT$(SP$+FP$,4)                     CN
·60 GOSUB216:GOTO64                           FK
·61 GOSUB208:IFK=UGOTO27                      EP
·62 IFE=62THENSYST:PRINTTP$SPC(13)"[RVSON
 ][c 8]"EM$:FORD=RTO1500:NEXT:GOTO27          PN
·63 ON140-HGOTO75,100,153                     KG
·64 GOSUB15:SYST:PRINT"[HOME][DOWN][RVSON
 ]"SPC(9)"USER CONVENTIONS LIST[DOWN]"R$"
 [RVSON] PROGRAM  :[c 8]";                    KM
·65 PRINTMID$(FI$,6);:GOSUB15:PRINTTAB(30
 )"PAGE "PA$"[DOWN]                           LJ
·66 PRINTR$"[RVSON] "W$"[c 8]"MA$;:GOSUB1
 5:PRINTTAB(31)MO$:SYSB:POKEO,8:PRINT:F$=
 "C                                           JI
·67 Y=.:X=R                                   OO
·68 AB=.:F=.:K$="[c 8]"+T$(X,.)+"[c 3]  "
 :IFLEN(K$)<10THENK$=LEFT$(K$+SP$+"[3" "]
 ",9)                                         MC
·69 K$=K$+T$(X,R):H=40:G=LEN(K$):GOSUB148
 :DT$(AB)=X$:GOSUB16:F=.                      LP
·70 H=32:G=LEN(K$):GOSUB148:DT$(AB)=X$:IF
 F=.GOTO70                                    DD
·71 Y=Y+AB+R:IFY>14THENGOSUB94:GOSUB15:Y=
 .:SYSB:POKEO,8:PRINT"[DOWN]";:GOTO71         BE
·72 IFDT$(AB)=""THENAB=AB-1                   GB
·73 C=.:FORD=RTOAB:PRINTTAB(C)DT$(D):C=7:
 NEXT:PRINT:IFX<=IGOTO68                      GM
·74 F$="":GOTO94                              KA
·75 SYST:OPEN3,4:GOSUB10:PRINT#3,B$Z$"24U
 SER CONVENTIONS"S$R$                         KN
·76 PRINT#3,"PROGRAM: "FP$R$R$"SOURCE: "M
 A$Z$"30"MO$Z$"50PAGE "PA$R$:X=R              KO
·77 F=.:K$=T$(X,.):G=LEN(K$)*2:IFG<8THENK
 $=LEFT$(K$+SP$,4):G=LEN(K$)                  FL
·78 X$=B$+K$+S$+"  ":H=78-(G+4):GOSUB83:K
 $=T$(X,R):GOSUB16                            DE
·79 G=LEN(K$):GOSUB148:GOSUB83:IFF=RGOTO8
 1                                            BO
·80 H=69:PRINT#3," ":PRINT#3,Z$"10";:G=LE
 N(K$):GOSUB148:GOSUB83:IFF=.GOTO80           BP
·81 IFX<=IGOTO77                              IL
·82 CLOSE3:GOSUB11:GOTO94                     EA
·83 G=LEN(X$):FORD=RTOG:Y$=MID$(X$,D,R):Y
 =ASC(Y$):IFY<195GOTO89                       AE
·84 ONY-194GOTO86,87,88                       IK
·85 PRINT#3,";";:GOTO90                       PO
·86 PRINT#3,CHR$(34);:GOTO90                  NL
·87 PRINT#3,",";:GOTO90                       ML
·88 Y$=":                                     JL
·89 PRINT#3,Y$;                               LL
·90 POKEQ,.:NEXT:IFF=RTHENPRINT#3,"           NM
·91 RETURN                                    IM
·92 SYS49159:GOTO94                           NG
·93 SYS49152                                  KF
·94 POKEO,22:PRINTR$"[RIGHT][RIGHT][RVSON
 ][c 5]"SP$"[3" "]SPACE BAR "V$"  "SP$:PO
 KEKB,.                                       FP
·95 GETH$:IFH$<>" "GOTO95                     BB
·96 IFF$="C"THENRETURN                        HF
·97 GOTO27                                    PD
·98 SYST:GOSUB15:PRINT"[HOME][DOWN][DOWN]
 [RIGHT]"Q$"[RVSON]"FI$"[RVSOFF]"Q$"[RVSO
 N] EXISTS                                    KJ
·99 PRINTR$"[RIGHT][RVSON] CHANGE 1 OR MO
 RE CHARACTERS":F$="C":SYSB:GOSUB94:F$=""
 :RETURN                                      OP
·100 CO=.:SYST:GOSUB15:PRINTTP$"[RVSON] <
 1> EDIT"R$"[RVSON] <2> ADD"                  AA
·101 GETC$:IFC$="2"THENM$="A":I=I+R:GOTO3
 4                                            JM
·102 IFC$<>"1"GOTO101                         NJ
·103 M$="M":J=I:FORI=RTOJ:HO=I                FN
·104 SYST:SYSB:U$=T$(I,.):GOSUB225:IFF$="
 R"GOTO121                                    MH
·105 PRINTTP$"[RVSON] <F>ILE"R$"[RVSON] <
 D>ELETE"R$"[RVSON] <E>SCAPE"R$"[RVSON] <
 S>CROLL"                                     OF
·106 IFF$=""THENGOSUB13:IFC$="Y"GOTO121       EL
·107 IFC$<>"S"GOTO115                         CA
·108 POKE650,255:POKEO,8:PRINT"[c 5][DOWN
 ] <S>CROLL[4" "]<RETURN> EDIT                NI
·109 I=I+1:IFI>JTHENI=R                       AG
·110 IFT$(I,.)=N$GOTO109                      FD
·111 HO=I:SYST:U$=T$(I,.):GOSUB225:FORD=R
 TO25:NEXT:POKEKB,.                           AE
·112 GETC$:IFC$=""GOTO112                     DF
·113 IFC$="S"GOTO109                          FL
·114 SYSB:POKE650,.:GOTO105                   BF
·115 IFC$="F"ORC$="E"THENI=J+R:GOTO143        OD
·116 CO=R:IFC$="D"GOTO139                     DB
·117 SYSB:POKEO,21:PRINT"[c 5][DOWN] [RVS
 ON]<F8>[RVSOFF] ABORT":C$="":GOSUB35:IFK
 =140GOTO104                                  NP
·118 IFK>133GOTO117                           GC
·119 SYST:GOSUB225:GOSUB15:IFC$="N"GOTO11
 7                                            DM
·120 T$(I,.)=U$                               KN
·121 SYSB:F=.:GOSUB15:POKEO,8                 PC
·122 PRINTR$"[RVSON][c 8]"F+R"[RVSOFF][c
 3] ";:U$=T$(I+F,R):GOSUB9:IFC$=" "THENU$
 ="[WHITE][s Q][c 3]"+MID$(U$,2)              GK
·123 IFH$=" "THENU$=LEFT$(U$,E-1)+"[WHITE
 ][s Q][c 3]                                  CC
·124 PRINTU$                                  BP
```

```
•125 IFT$(I+F+R,.)=N$ORT$(I+F+R,.)=D$THEN
 F=F+R:GOTO122                              OA
•126 IFF$="R"THENI=I+F:GOTO136               MN
•127 POKEO,20:INPUT"[DOWN][DOWN][c 8][4"[
 RIGHT]"]CONFIRM  Y[3"[LEFT]"]";C$:IFC$="
 Y"THENI=I+F:GOTO143                        CL
•128 CO=R:U$=T$(I,.):SYST:GOSUB225:GOSUB1
 5:SYSB:POKEO,2:PRINT"[DOWN]                BA
•129 U$=T$(I,R):GOSUB226:IFF=.GOTO137        JC
•130 GOSUB13:IFC$="N"GOTO137                 JG
•131 IFT$(I+R,.)<>N$GOTO142                  NL
•132 POKEO,20:PRINTR$"[c 5]<C>ONTINUE"R$"
 <D>ELETE REMAINDER OF OLD "E$              HN
•133 GETH$:IFH$="D"GOTO141                   IM
•134 IFH$<>"C"ANDH$<>R$GOTO133               CI
•135 I=I+R:GOTO128                           JO
•136 F$="C":GOSUB94:F$="":GOTO143            CG
•137 CO=R:GOSUB15:GOSUB50:G=.:IFC$="N"GOT
 O137                                       NN
•138 GOTO131                                 CD
•139 SYST:PRINT"[HOME][RVSON] "D$:GOSUB13
 :IFC$<>"Y"THENCO=.:GOTO104                 GE
•140 T$(I,.)=D$:T$(I,R)=D$                   HC
•141 IFT$(I+R,.)=N$THENI=I+R:GOTO140         ID
•142 I=HO:F$="R":GOTO104                     OB
•143 NEXTI:I=J:SYST:SYSB:IFCO=.ORC$="E"GO
 TO27                                       DC
•144 IFM$="A"GOTO60                          BC
•145 F=.:FORD=RTOI:IFT$(D,.)<>D$THENF=F+1
 :T$(F,.)=T$(D,.):T$(F,R)=T$(D,R)           GI
•146 NEXT:I=F:T$(I+R,.)="":IFI=.THENPRINT
 TP$"[RVSON][RIGHT]NO MORE RECORDS IN FIL
 E":GOTO153                                 OA
•147 GOTO60                                  PG
•148 AB=AB+R:IFG<=HTHENX$=K$:K$="":F=R:RE
 TURN                                       FL
•149 H2=.:FORD=HTORSTEP-R:X$=MID$(K$,D,R)    PO
•150 IFX$=" "THENX$=LEFT$(K$,D-R):K$=MID$
 (K$,D+R):D=.:H2=R                          CH
•151 NEXT:IFH2=.THENX$=LEFT$(K$,H):K$=MID
 $(K$,H+1)                                  OL
•152 RETURN                                  IM
•153 POKEO,8:PRINTR$" [c 3]"FI$:INPUT"[DO
 WN] DELETE  Y[3"[LEFT]"]";C$               AH
•154 IFC$="Y"THENOPEN15,V,15,"S0:"+FI$:PR
 INT#15,"I":PRINT"[DOWN][c 3] "D$:CLOSE15   AB
•155 GOTO61                                  PF
•156 C=11:L=R:X$=PR$                         DI
•157 SYST:SYSB:FP$="":GOSUB15:PRINT"[HOME
 ][3"[DOWN]"]"SPC(27)"[RVSON][c 5]F1 DIRE
 CTORY"R$R$:GOSUB15                         PO
•158 PRINTSPC(11)A$:IFX$=PR$THENPRINT"[4"
 [UP]"][RVSON][RIGHT]1 TO 11 CHARS"R$"[RV
 SON][RIGHT]OMIT CONV. PREFIX               GG
•159 G=.:PRINT"[HOME][RVSON][DOWN] "X$"[c
 @][LEFT]";                                 LL
•160 GETK$:K=ASC(K$+CHR$(.)):IFK=.ORK>133
 GOTO160                                    CN
•161 IFK=UTHENRETURN                         BI
•162 IFK=133THENF$="C":GOSUB93:F$="":GOTO
 156                                        JE
•163 IF(K<>13ANDK<>20)THENIFK<32ORK>127OR
 K=34GOTO160                                DP
•164 IF((K=13ORK=20)ANDG=.)OR(K=13ANDG<L)
 GOTO160                                    AA
•165 IFK=13GOTO169                           AP
•166 IFK=20THENFP$=LEFT$(FP$,G-R):G=G-R:K
 $=" [LEFT][LEFT]":GOTO168                  DJ
•167 FP$=FP$+K$:G=LEN(FP$)                   GP
•168 PRINTK$"[c @]";:POKEQ,.:PRINT"[LEFT]
 ";:IFG<CGOTO160                            LJ
•169 POKEKB,.:PRINT" ":GOSUB13:IFC$<>"Y"G
 OTO157                                     EP
•170 IFM$<>"M"THENSYST                       HN
•171 RETURN                                  IM
•172 G=.:POKEO,17:PRINT"[DOWN][c 3] LENGT
 H:";:POKEN,48:POKEN+R,48:POKEN+S+R,R:POK
 EN+S,R                                     EB
•173 P=R:PRINTTAB(18)"LIMIT:[c 8]"C:U$=""
 :C0$="":IF(T$(I,.)<>N$)ORC=28GOTO176       OE
•174 C0$="[c 3]"+T$(I-R,R)+"[c 7]            NJ
•175 GOSUB15:POKEO,6:PRINTR$"[RVSON] PREV
 IOUS PART OF "E$" IN [c 3]PINK             LG
•176 POKEO,7:PRINT"[DOWN][RVSOFF][c 7]"X$
 " "C0$U$"[c @][LEFT]";                     DO
•177 GETK$:K=ASC(K$+CHR$(.)):IFK<31AND(K<
 >13ANDK<>20)ORK>140GOTO177                 ME
•178 IF(K=20ORK=13)ANDG=.GOTO177             FP
•179 IFK=13GOTO201                           AO
•180 IFK=20THENU$=LEFT$(U$,G-R):P=-R:GOTO
 195                                        JA
•181 IFK<133GOTO190                          ED
•182 IF(C=80)OR(G>C-5)OR(K=137)GOTO177       PP
•183 ONK-132GOTO185,186,187,188              NO
•184 RETURN                                  IM
•185 K$=F1$:GOTO189                          BG
•186 K$=F3$:GOTO189                          AI
•187 K$=F5$:GOTO189                          BK
•188 K$=F7$                                  MC
•189 P=5:GOTO194                             IP
•190 IFK=34THENK$=G$                         BB
•191 IFK=44THENK$=J$                         CL
•192 IFK=58THENK$=O$                         EP
•193 IFK=59THENK$=P$                         EP
•194 U$=U$+K$                                MG
•195 PRINTK$"[c @]";:POKEQ,.:PRINT"[LEFT]
 ";                                         IE
•196 M=PEEK(N+R)+P:IFM>57THENM=47+(M-57):
 POKEN,PEEK(N)+R                            LJ
•197 IFM<48THENM=57:POKEN,PEEK(N)-1          HK
•198 POKEN+R,M:P=R:G=LEN(U$):IFG=CGOTO201    NK
•199 IFG>.75*CTHENPOKES+R,75:POKES,35:POK
 ES+4,33:FORD=RTO25:NEXT:POKES+4,32         OH
•200 GOTO177                                 CN
•201 PRINT" ":POKEKB,.:POKEO,15:PRINT"[DO
 WN][c 8][4" "]CONFIRM[3" "]Y[3"[LEFT]"]"
```

```
                                                  JA
·202 IFC>28ANDA<2ANDM$<>"M"THENPRINTR$"[U
P][UP]"V$"[3" "][UPARROW]"R$"TO[UP] "SPC
(9);                                              MK
·203 INPUTC$:C$=RIGHT$(C$,1):IFM$="M"THEN
RETURN                                            OO
·204 IFC$="N"THENFORD=9TO17:POKE781,D:SYS
59903:NEXT:GOTO172                                KI
·205 RETURN                                       IM
·206 FI$="CONV."+FP$:OPEN15,V,15,"I":OPEN
3,V,3,FI$+",U,R                                   OO
·207 SYST:INPUT#15,E,EM$:CLOSE3:CLOSE15:R
ETURN                                             IE
·208 GOSUB156:IFK=UTHENRETURN                     KK
·209 GOSUB206:IFE=62ORH=137THENRETURN             AD
·210 GOSUB14:G=R:PRINT" READING [c 8]"FI$
:OPEN2,V,2,FI$+",U,R                              AH
·211 INPUT#2,I,MA$,PA$,MO$:J=I:PA$=RIGHT$
(SP$+PA$,4):GOSUB10                               OI
·212 FORD=RTOJ:INPUT#2,T$(D,.):NEXT               PF
·213 FORD=RTOJ:INPUT#2,U$:GOSUB9:IFC$="[F
8]"THENU$=" "+MID$(U$,2)                          PO
·214 IFH$="[F8]"THENU$=LEFT$(U$,E-R)+" "          FE
·215 T$(D,R)=U$:GOTO221                           OJ
·216 GOSUB14:G=2:PRINT" WRITING [c 8]"FI$
:OPEN2,V,2,"@0:"+FI$+",U,W                        JI
·217 PRINT#2,I,R$MA$R$PA$R$MO$:GOSUB10:FO
RD=RTOI:PRINT#2,T$(D,.):NEXT                      DK
·218 FORD=RTOI:U$=T$(D,R):GOSUB9:IFC$=" "
THENPRINT#2,"[F8]";:U$=MID$(U$,2)                 NB
·219 IFH$=" "THENU$=LEFT$(U$,E-R)+"[F8]           ID
·220 PRINT#2,U$                                   HH
·221 NEXT:CLOSE2:CLOSE15:SYST:GOSUB11:FP$
=MID$(FI$,6):GOSUB206:IFE=.THENRETURN             MO
·222 POKE0,8:PRINT"[DOWN][RVSON][RIGHT]
"STR$(E);" "EM$:INPUT" [DOWN][RVSON]TRY
AGAIN  Y[3"[LEFT]"]";C$                           CE
·223 IFC$="Y"THENSYSB:ONGGOTO210,216              GF
·224 GOTO27                                       PD
·225 GOSUB15:PRINT"[HOME][RVSON] ";:IFU$=
N$ORU$=D$THENPRINTU$:RETURN                       MG
·226 E=LEN(U$)                                    JL
·227 FORD=RTOE:C$=MID$(U$,D,R):IF(D=RORD=
E)ANDC$=" "THENPRINT"[RVSON][s Q]";:GOTO
234                                               FO
·228 C=ASC(C$):IFC<195THENPRINT"[RVSON]"C
$;:GOTO234                                        MH
·229 ON199-CGOTO233,232,231                       LM
·230 PRINT"[RVSOFF]"Q$"[RVSON]";:GOTO234          PL
·231 PRINT",";:GOTO234                            JK
·232 PRINT":";:GOTO234                            JE
·233 PRINT";";                                    FF
·234 POKEQ,.:NEXT:PRINTR$:RETURN                  AE
```

ALL ML.OBJ

Starting address in hex: C000
Ending address in hex: C434

```
C000: EE 7D C3 A9 09 D0 02 A9 5F
C008: 08 8D 93 C3 20 B7 C1 20 AE
C010: D9 C1 A2 FF 8E 7C C3 A9 C6
C018: 07 A2 08 A0 00 20 BA FF 45
C020: A9 02 A2 94 A0 C3 20 BD 45
C028: FF 20 C0 FF A2 07 20 C6 99
C030: FF A9 96 A0 C3 20 1E AB BE
C038: A2 03 A0 08 18 20 F0 FF AF
C040: 20 E4 FF C9 01 F0 0A A9 B4
C048: 06 A0 C4 20 1E AB 4C 8B 75
C050: C1 20 E4 FF C9 12 D0 F9 BD
C058: 20 D2 FF A0 18 20 E4 FF 09
C060: C9 7F B0 04 C9 1F B0 02 F9
C068: A9 A0 20 D2 FF A9 00 89 D8
C070: 12 88 D0 E9 A9 92 20 D2 F4
C078: FF AE 93 C3 A0 00 18 20 57
C080: F0 FF 20 E4 FF F0 0A C9 3B
C088: 2A D0 F7 20 D2 FF 4C 82 3D
C090: C0 AD 7D C3 F0 05 AD 7E 62
C098: C3 F0 3B A9 0D 20 D2 FF 32
C0A0: EE 7C C3 AD 7C C3 C9 0C 93
C0A8: D0 2C A2 17 A0 01 18 20 39
C0B0: F0 FF A9 43 A0 C3 20 1E 31
C0B8: AB A5 C5 C9 3C D0 FA A2 44
C0C0: 08 20 FF E9 E8 E0 19 D0 86
C0C8: F8 A9 00 8D 7C C3 A2 09 E4
C0D0: A0 00 18 20 F0 FF 20 E4 9F
C0D8: FF 20 E4 FF 20 E4 FF 8D 70
C0E0: 91 C3 20 E4 FF 8D 92 C3 1F
C0E8: 20 E4 FF C9 0D D0 06 20 BB
C0F0: 9C C1 4C 84 C1 C9 22 D0 9E
C0F8: EF AD 7D C3 F0 65 A9 00 D7
C100: 8D 7F C3 8D 7E C3 20 E4 A5
C108: FF C9 22 D0 03 4C 82 C0 57
C110: AE 7F C3 EE 7F C3 BC 80 71
C118: C3 F0 13 C0 2A F0 09 C0 85
C120: 3F F0 05 DD 80 C3 D0 31 79
C128: 9D 22 C4 4C 06 C1 9D 22 80
C130: C4 20 E4 FF C9 22 F0 09 DF
C138: AE 7F C3 EE 7F C3 4C 2E D6
C140: C1 AE 7F C3 A9 00 9D 22 5D
C148: C4 20 9C C1 A9 22 A0 C4 BC
C150: 20 1E AB EE 7E C3 4C 82 3A
C158: C0 20 E4 FF C9 22 D0 F9 D4
C160: 4C 82 C0 20 9C C1 20 E4 73
C168: FF C9 22 D0 03 4C 82 C0 B7
C170: C9 7F B0 04 C9 1F B0 02 0A
C178: A9 20 20 D2 FF A9 00 89 68
C180: 12 4C 66 C1 A9 6E A0 C3 83
C188: 20 1E AB 20 CC FF A9 07 10
C190: 20 C3 FF A9 00 8D 7D C3 EC
C198: 8D 7E C3 60 A9 0C 8D 86 92
C1A0: 02 AE 91 C3 AD 92 C3 20 CA
C1A8: CD BD 38 20 F0 FF 18 A0 36
C1B0: 06 8C 86 02 4C F0 FF A2 AB
C1B8: A1 A9 A0 9D FF 03 9D 9E 81
C1C0: 04 CA D0 F7 AD 87 C2 8D DD
C1C8: 20 D0 A2 A1 9D FF D7 9D 11
C1D0: 9F D8 CA D0 F7 8E 21 D0 5D
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 99 and 100 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
C1D8: 60 A2 08 20 FF E9 E8 E0 B7
C1E0: 19 D0 F8 60 20 B7 C1 20 DD
C1E8: D9 C1 AD 87 C2 8D 86 02 92
C1F0: A9 88 A0 C2 4C 1E AB AD 4A
C1F8: 0E DC 29 FE 8D 0E DC A5 2A
C200: 01 29 FB 85 01 BD 00 D0 3B
C208: 9D 00 08 BD 00 D1 9D 00 DA
C210: 09 BD 00 D2 9D 00 0A BD 0F
C218: 00 D3 9D 00 0B BD 00 D4 27
C220: 9D 00 0C BD 00 D5 9D 00 FA
C228: 0D BD 00 D6 9D 00 0E BD 33
C230: 00 D7 9D 00 0F E8 D0 CD 3C
C238: A5 01 09 04 85 01 AD 0E 2E
C240: DC 09 01 8D 0E DC A2 00 42
C248: A0 28 BD 5F C2 9D 18 0A B0
C250: E8 88 D0 F6 AD 18 D0 29 49
C258: F0 09 02 8D 18 D0 60 66 91
C260: 66 66 00 00 00 00 00 00 2D
C268: 00 00 00 00 18 18 30 00 C8
C270: 00 18 00 00 18 00 00 00 A0
C278: 00 18 00 00 18 18 30 99 8A
C280: 99 99 FF FF FF FF FF 0B BE
C288: 13 11 1D 1D 12 20 46 31 90
C290: 20 45 4E 54 45 52 20 44 94
C298: 41 54 41 20 20 20 20 C2 B2
C2A0: 20 20 46 32 20 44 45 4C 4F
C2A8: 45 54 49 4F 4E 53 20 0D A9
C2B0: 1D 1D 12 20 46 33 20 44 FA
C2B8: 49 52 45 43 54 4F 52 59 2C
C2C0: 20 20 20 20 20 C2 20 20 64
C2C8: 46 34 20 4D 4F 44 49 46 D3
C2D0: 49 43 41 54 49 4F 4E 0D E6
C2D8: 1D 1D 12 20 46 35 20 44 25
C2E0: 49 53 4B 20 43 4F 4E 54 1E
C2E8: 45 4E 54 20 20 C2 20 20 14
C2F0: 46 36 20 48 41 52 44 20 CD
C2F8: 43 4F 50 59 0D 1D 1D 12 8E
C300: 20 46 37 20 4C 4F 41 44 DE
C308: 20 46 49 4C 45 53 20 20 DC
C310: 20 20 C2 20 20 46 38 20 F1
C318: 42 4F 52 44 45 52 20 43 3B
C320: 4F 4C 4F 52 11 0D 1D 1D B5
C328: 1D 1D 1D 1D 1D 1D 1D 1D 11
C330: 1D 12 45 4E 54 45 52 20 FE
C338: 53 45 4C 45 43 54 49 4F 92
C340: 4E 0D 00 12 9B 20 20 20 A9
C348: 20 20 20 20 20 53 50 41 CD
C350: 43 45 20 42 41 52 20 54 43
C358: 4F 20 43 4F 4E 54 49 4E 94
C360: 55 45 20 20 20 20 20 20 BB
C368: 20 20 20 92 98 00 96 42 CC
C370: 4C 4F 43 4B 53 20 46 52 A6
C378: 45 45 0D 00 00 00 00 00 10
C380: 43 4F 4E 56 2E 2A 00 00 10
C388: 00 00 00 00 00 00 00 00 88
C390: 00 00 00 00 24 30 13 11 09
C398: 11 1D 1D 1D 1D 1D 1D 1D 75
C3A0: 12 96 2A 2A 2A 2A 2A 2A 46
C3A8: 2A 2A 2A 2A 2A 2A 2A 2A F9
C3B0: 2A 2A 2A 2A 2A 2A 2A 2A 02
C3B8: 2A 2A 2A 2A 0D 1D 1D 1D C5
C3C0: 1D 1D 1D 1D 12 96 2A 20 28
C3C8: 20 20 20 20 20 20 20 20 C9
C3D0: 20 20 20 20 20 20 20 20 D1
C3D8: 20 20 20 20 20 20 20 2A E3
C3E0: 0D 1D 1D 1D 1D 1D 1D 1D B9
C3E8: 12 96 2A 2A 2A 2A 2A 2A 8E
C3F0: 2A 2A 2A 2A 2A 2A 2A 2A 42
C3F8: 2A 2A 2A 2A 2A 2A 2A 2A 4A
C400: 2A 2A 2A 2A 98 00 12 98 EB
C408: 20 2A 2A 2A 20 45 52 52 B0
C410: 4F 52 20 4F 4E 20 52 45 27
C418: 41 44 21 20 2A 2A 2A 20 7D
C420: 96 00 00 00 00 00 00 00 B6
C428: 00 00 00 00 00 00 00 00 28
C430: 00 00 00 00 00 30
```

THE ADVENTURER
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DUNGEON MAKER

```
•10 REM DUNGEON MAKER                                   BN
•20 POKE56334,PEEK(56334)AND254                         DN
•30 POKE1,PEEK(1)AND251                                 IM
•40 FORI=0TO511:POKEI+30720,PEEK(I+53248)
:NEXT                                                   DF
•50 POKE1,PEEK(1)OR4                                    BE
•60 POKE56334,PEEK(56334)OR1                            PD
•70 FORI=0TO151                                         PM
•80 READD:POKEI+31240,D                                 BD
•90 NEXT                                                IA
•100 V1$="[4" "][DOWN][4"[LEFT]"][4" "][D
OWN][4"[LEFT]"][4" "][UP][UP]"                          DN
•110 V2$="[4"[s A]"][DOWN][4"[LEFT]"][4"[
s A]"][DOWN][4"[LEFT]"][4"[s A]"][UP][UP
]"                                                      BI
•120 V3$="[3"[s A]"][s B][DOWN][4"[LEFT]"
][s A][s B]  [DOWN][4"[LEFT]"][s B][3" "
][UP][UP]"                                              LI
•130 V4$="[s E][3"[s A]"][DOWN][4"[LEFT]"
]  [s E][s A][DOWN][4"[LEFT]"][3" "][s E
][UP][UP]"                                              JA
•140 V5$="[s D][3" "][DOWN][4"[LEFT]"][s
A][s D]  [DOWN][4"[LEFT]"][3"[s A]"][s D
][UP][UP]"                                              CE
•150 V6$="[3" "][s C][DOWN][4"[LEFT]"]  [
s C][s A][DOWN][4"[LEFT]"][s C][3"[s A]"
][UP][UP]"                                              NA
•160 BLOCK=16384                                        CO
•170 POKE53280,0:POKE53281,0:POKE646,0                  AH
```

```
·200 POKE56578,PEEK(56578)OR3                BN
·210 POKE56576,(PEEK(56576)AND252)OR2        KG
·220 POKE53272,(PEEK(53272)AND240)OR14       NA
·300 FORI=2 TO 13                            LH
·310 POKE53272,(PEEK(53272)AND15)ORI*16      JK
·320 M=BLOCK+1024*I                          PG
·330 POKE648,INT(M/256)                      PI
·340 PRINT"[CLEAR]"                          HH
·350 FORA=1TO8:READD$                        LA
·360 FORB=1TO10                              KM
·370 IFMID$(D$,B,1)="A"THENPRINT V3$;        IP
·380 IFMID$(D$,B,1)="B"THENPRINT V4$;        FH
·390 IFMID$(D$,B,1)="C"THENPRINT V5$;        HD
·400 IFMID$(D$,B,1)="D"THENPRINT V6$;        JD
·410 IFMID$(D$,B,1)="E"THENPRINT V5$;        IN
·420 IFMID$(D$,B,1)=" "THENPRINT V1$;        BD
·430 IFMID$(D$,B,1)="."THENPRINT V2$;        CJ
·440 NEXT B:PRINT"[DOWN][DOWN]";             DM
·450 NEXT A                                  MF
·460 NEXT I                                  MN
·500 SL=0:SH=68:EL=168:EH=122                LN
·510 OPEN 8,8,8,"DJ"                         IA
·520 POKE 251,SL                             BN
·530 POKE 252,SH                             AC
·540 POKE 780,251                            AD
·550 POKE 781,EL                             AH
·560 POKE 782,EH                             AM
·570 SYS 65496                               LK
·580 GOTO 2000                               EP
·600 DATA 254,254,254,0,239,239,239,0        JD
·610 DATA 254,252,248,0,224,192,128,0        KJ
·620 DATA 0,2,6,0,15,31,63,0                 BH
·630 DATA 128,192,224,0,232,236,238,0        BO
·640 DATA 126,62,30,0,15,7,3,0               ED
·650 DATA 152,216,126,27,25,108,199,195      NA
·660 DATA 24,126,219,185,120,216,120,56      CK
·670 DATA 24,24,126,219,152,60,102,96        ED
·680 DATA 24,24,126,219,25,60,102,6          EK
·690 DATA 25,27,126,216,152,54,227,195       GA
·700 DATA 24,126,219,157,30,27,30,28         CF
·710 DATA 0,0,0,0,255,0,255,255              KF
·720 DATA 0,0,0,0,0,0,0,255                  KF
·730 DATA 60,231,0,0,0,0,0,0                 CG
·740 DATA 0,0,0,60,231,0,0,0                 AO
·750 DATA 24,24,24,126,24,24,0,0             EL
·760 DATA 0,0,24,24,126,24,24,24             DF
·770 DATA 0,12,12,255,12,12,0,0              EB
·780 DATA 0,48,48,255,48,48,0,0              LB
·799 :                                       DI
·800 DATA "[10"."]"                          KL
·810 DATA ".A B[4"."]A "                     MN
·820 DATA ".[4" "]B.AD."                     JM
·830 DATA ".C D.C  .."                       LK
·840 DATA ".. [4"."]CB."                     LH
·850 DATA "..CB[4"."] ."                     ND
·860 DATA "[3"."] [3"."]AD."                 KJ
·870 DATA "[3"."] [3"."] .."                 GF
·880 :                                       DI
·900 DATA "[10"."]"                          KL
·910 DATA " B[4"."]A  B"                     KP
·920 DATA ". B..A ..C"                       MN
·930 DATA ". C  D [3"."]"                    JE
·940 DATA ".CB..AD[3"."]"                    ON
·950 DATA ".. .. [4"."]"                     HF
·960 DATA "..CBAD[4"."]"                     PL
·970 DATA "[3"."]CD[5"."]"                   OC
·980 :                                       DI
·1000 DATA"[10"."]"                          KL
·1010 DATA"[10"."]"                          KL
·1020 DATA"B[3"."]AB[4"."]"                  NK
·1030 DATA"CB.ADCB.A "                       CG
·1040 DATA".C DABC D."                       AA
·1050 DATA"[3"."]A  B.A "                    KE
·1060 DATA".A[6" "]D."                       GO
·1070 DATA". [8"."]"                         KC
·1080 :                                      DI
·1100 DATA"[10"."]"                          KL
·1110 DATA"[6"."]A B."                       LN
·1120 DATA"..A[6" "]."                       FK
·1130 DATA"  D. .C D."                       LA
·1140 DATA"[7"."] .."                        JE
·1150 DATA"[7" "]D.."                        EA
·1160 DATA"[10"."]"                          KL
·1170 DATA"[10"."]"                          KL
·1180 :                                      DI
·1200 DATA"[3"."] [3"."]CB."                 KN
·1210 DATA"[3"."] [4"."] ."                  IB
·1220 DATA"[3"."] [3"."]AD."                 KJ
·1230 DATA"[3"."] [3"."] .."                 GF
·1240 DATA"[3"."]CB..CBA"                    OK
·1250 DATA".ABA B..CD"                       AL
·1260 DATA". CD.C B.."                       NF
·1270 DATA". [5"."] .."                      IP
·1280 :                                      DI
·1300 DATA"[10"."]"                          KL
·1310 DATA"[5"."]A[4" "]"                    HA
·1320 DATA"[4"."]AD[4"."]"                   NE
·1330 DATA"[4"."] [5"."]"                    II
·1340 DATA"[10" "]"                          AL
·1350 DATA"[4"."] [5"."]"                    II
·1360 DATA"[4"."][4" "].."                   GL
·1370 DATA"[4"."] .. .."                     GF
·1380 :                                      DI
·1400 DATA"AD[8"."]"                         LI
·1410 DATA"D[4"."] [4"."]"                   KE
·1420 DATA"[5"."] [3"."]A"                   KL
·1430 DATA"[5"."] .A D"                      LM
·1440 DATA"[3" "].[3" "]D.."                 FH
·1450 DATA"[5"."] [4"."]"                    JO
·1460 DATA"[5"."] [4"."]"                    JO
·1470 DATA"[5"."] [4"."]"                    JO
·1480 :                                      DI
·1500 DATA"[10"."]"                          KL
·1510 DATA".A  B[5"."]"                      JI
·1520 DATA" D..CB.A ."                       NL
·1530 DATA"[5"."]C D ."                      LI
```

```
•1540 DATA"[5"."]A B ."                     LM
•1550 DATA"[4"."]AD.C ."                    NG
•1560 DATA"[3"."]AD[5"."]"                  NM
•1570 DATA"[3"."] [6"."]"                   II
•1580 :                                     DI
•1600 DATA". [4"."]AD.."                    MN
•1610 DATA".C[4" "]D[3"."]"                 IM
•1620 DATA".. [7"."]"                       KC
•1630 DATA".. [4"."]A  "                    IN
•1640 DATA".A B..AD.."                      OO
•1650 DATA".[5" "]D[3"."]"                  GA
•1660 DATA".C D[6"."]"                      MP
•1670 DATA"[10"."]"                         KL
•1680 :                                     DI
•1700 DATA"[4"."] .. .."                    GF
•1710 DATA"[3"."]AD..CB."                   AB
•1720 DATA"..AD[4"."]CB"                    AD
•1730 DATA"  D..A B.C"                      LA
•1740 DATA"[4"."]AD.CB."                    PJ
•1750 DATA".AB. .A.C "                      MG
•1760 DATA".[6" "]B.."                      FN
•1770 DATA"[10"."]"                         KL
•1780 :                                     DI
•1800 DATA"[4"."]AD[4"."]"                  NE
•1810 DATA"[4"."] [5"."]"                   II
•1820 DATA"..A D[5"."]"                     MP
•1830 DATA"  D[3"."]A[3" "]"                IL
•1840 DATA"[6"."] [3"."]"                   JO
•1850 DATA"[7" "]B.."                       EK
•1860 DATA"[7"."]C  "                       JA
•1870 DATA"[10"."]"                         KL
•1880 :                                     DI
•1900 DATA"..AD[6"."]"                      MK
•1910 DATA".AD.A B[3"."]"                   NI
•1920 DATA". .AD.CB.."                      PK
•1930 DATA" DAD[3"."] .."                   KG
•1940 DATA".AD[3"."]A B."                   OA
•1950 DATA"AD[4"."][3" "]."                 JN
•1960 DATA"D[5"."]C D."                     ND
•1970 DATA"[10"."]"                         KL
•2000 POKE56578,PEEK(56578)OR3              BN
•2010 POKE56576,(PEEK(56576)AND252)OR3      KF
•2020 POKE53272,(PEEK(53272)AND240)OR4      IB
•2030 POKE53272,(PEEK(53272)AND15)OR16      NO
•2040 POKE 648,4                            JJ
•2050 PRINT"[CLEAR][WHITE][DOWN]SAVE COMP
 LETED"                                     HO
```

THE ADVENTURER

```
•10 REM LOAD SCREEN & TITLE                 DJ
•11 :                                       DI
•20 POKE53280,0:POKE53281,0                 BH
•30 PRINT"[CLEAR][6"[DOWN]"]";              BO
•40 PRINTTAB(12)"[c 6]THE ADVENTURER[DOWN
 ]"                                         NC
•50 PRINTTAB(9)"[c 3]BY JEAN-FRANCOIS HEO
 N[DOWN]"                                   OH
•60 PRINTTAB(11)"[WHITE]JOYSTICK IN PORT#
 2[DOWN]"                                   DD
•70 PRINTTAB(13)"PLEASE WAIT[3"."]"         JB
•80 IFA=0THENA=1:LOAD"DJ",8,1               AF
•99 :                                       DI
•100 REM VARIABLES                          DK
•101 :                                      DI
•110 DIM SCR(2,3),IT(2,3,1),NM(2,3)         FE
•120 BLOCK=16384:SH=1:MT=1:K=1:S=54272      GM
•130 X=7:Y=7:X1=0:Y1=0:V=2:M=4:MAN=1        NJ
•140 FORI=0TO2:FORJ=0TO3                    FI
•150 SCR(I,J)=V:V=V+1                       KI
•160 READD:IT(I,J,0)=D                      PO
•170 READD:IT(I,J,1)=D                      PJ
•175 READD:NM(I,J)=D                        KL
•180 NEXT J,I                               EI
•185 DATA 12,6,1,4,9,9,8,18,11,32,6,4       CI
•190 DATA 12,3,5,16,12,7,20,9,8,32,12,6     OA
•195 DATA 4,15,3,4,18,10,28,9,12,28,12,2    HO
•199 :                                      DI
•200 REM INITIALIZE                         HA
•201 :                                      DI
•210 FORI=55295TO56255:POKEI,9:NEXT         LI
•215 FORL=STOS+24:POKEL,0:NEXT              DH
•220 POKE56578,PEEK(56578)OR3               BN
•230 POKE56576,(PEEK(56576)AND252)OR2       KG
•240 POKE53272,(PEEK(53272)AND240)OR14      NA
•250 GOSUB 6000                             FH
•260 PO=BLOCK+1024*SCR(Y1,X1)+X+Y*40        BL
•270 CO=55296+X+Y*40                        GH
•280 POKE PO,74:POKECO,1                    KM
•999 :                                      DI
•1000 REM MAN MOVES                         PH
•1001 :                                     DI
•1005 IF MAN=0THENGOSUB5000:GOTO7000        MG
•1010 J=PEEK(56320)                         CD
•1020 IF(JAND16)=0 THEN 3000                IO
•1030 IF(JAND1)=0 THENM=1:MV=-40:GOTO1080   HJ
•1040 IF(JAND2)=0 THENM=2:MV=40:GOTO1080    LH
•1050 IF(JAND4)=0 THENM=3:MV=-1:GOTO1080    MO
•1060 IF(JAND8)=0 THENM=4:MV=1:GOTO1080     BE
•1070 GOTO 2000                             EP
•1080 ON M GOTO 1100,1120,1140,1160         CP
•1090 GOTO 1200                             FE
•1100 IFY-1=-1THENY=24:POKEPO,32:POKECO,9
 :Y1=Y1-1:GOSUB6000:GOTO 1200               BK
•1110 GOTO 1170                             FM
•1120 IFY+1=24THENY=-1:POKEPO,32:POKECO,9
 :Y1=Y1+1:GOSUB6000:GOTO 1200               FI
•1130 GOTO 1170                             FM
•1140 IFX-1=-1THENX=40:POKEPO,32:POKECO,9
 :X1=X1-1:GOSUB6000:GOTO 1200               OC
•1150 GOTO 1170                             FM
•1160 IFX+1=40THENX=-1:POKEPO,32:POKECO,9
 :X1=X1+1:GOSUB6000:GOTO 1200               BM
•1170 IF PEEK(PO+MV)>64ANDPEEK(PO+MV)<70
 THEN2000                                   CC
•1180 IF PEEK(PO+MV)=76 AND K=NM(Y1,X1)TH
```

```
EN GOSUB 4500:GOTO 1200                    GO
•1190 IF PEEK(PO+MV)=76 THEN GOSUB4520:GO
 TO2000                                    GC
•1195 IF PEEK(PO+MV)>76ANDPEEK(PO+MV)<80
 THEN GOSUB5000:GOTO7000                   JD
•1200 ON M GOSUB 1220,1230,1240,1250       FL
•1210 GOTO 1260                            FO
•1220 Y=Y-1:RETURN                         AF
•1230 Y=Y+1:RETURN                         AI
•1240 X=X-1:RETURN                         AB
•1250 X=X+1:RETURN                         AE
•1260 PQ=PO:CQ=CO                          AD
•1270 PO=BLOCK+1024*SCR(Y1,X1)+X+Y*40      BL
•1280 CO=55296+X+Y*40                      GH
•1290 POKE CO,1                            IM
•1300 ON M GOSUB 1330,1330,1350,1370       AN
•1310 POKE PQ,32:POKE CQ,9:GOSUB 4000      PM
•1320 GOTO 2000                            EP
•1330 POKE PO,71+SH:SH=SH+1:IFSH=3THENSH=
 1                                         EH
•1340 RETURN                               IM
•1350 POKE PO,69+SH:SH=SH+1:IFSH=3THENSH=
 1                                         HM
•1360 RETURN                               IM
•1370 POKE PO,73+SH:SH=SH+1:IFSH=3THENSH=
 1                                         OJ
•1380 RETURN                               IM
•1999 :                                    DI
•2000 REM MONSTER MOVES                    DF
•2001 :                                    DI
•2010 MV=0                                 IE
•2020 IF MT=0 THEN 2500                    IM
•2030 IF X<A THEN MM=1:MV=-1:GOTO2070      BA
•2040 IF X>A THEN MM=2:MV=1:GOTO2070       DL
•2050 IF Y<B THEN MM=3:MV=-40:GOTO2070     FL
•2060 IF Y>B THEN MM=4:MV=40               OK
•2070 IF PEEK(PM+MV)>64 AND PEEK(PM+MV)<7
 0 THEN 1000                               AN
•2080 IF PEEK(PM+MV)>69 AND PEEK(PM+MV)<7
 6 THEN MAN=0                              MD
•2090 IF PEEK(PM+MV)=76 THEN 1000          CF
•2100 ON MM GOSUB 2120,2130,2140,2150      CH
•2110 GOTO 2160                            FC
•2120 A=A-1:RETURN                         NF
•2130 A=A+1:RETURN                         NI
•2140 B=B-1:RETURN                         OJ
•2150 B=B+1:RETURN                         OM
•2160 PW=PM:CW=CM                          BP
•2170 PM=BLOCK+1024*SCR(Y1,X1)+A+B*40      FB
•2180 CM=55296+A+B*40                      DN
•2190 POKE CM,13                           MJ
•2200 POKE PM,76+MT:MT=MT+1:IFMT=4THENMT=
 1                                         EN
•2210 POKE PW,32:POKE CW,9                 JO
•2220 GOTO 2500                            FE
•2499 :                                    DI
•2500 REM SCORE & KEY SUB-ROUTINE          NJ
•2501 :                                    DI
•2510 PRINT"[HOME][24"[DOWN]"]";           NE
•2520 PRINT"[YELLOW]SCORE:"SCTAB(20)"[c 6
 ]KEY NUMBER:"K"[HOME]"                    JI
•2530 GOTO 1000                            FC
•2999 :                                    DI
•3000 REM SHOOT ROUTINE                    FI
•3001 :                                    DI
•3005 GOSUB 3600:REM SOUND                 LH
•3010 ON M GOTO 3020,3100,3180,3260        OD
•3020 IF Y=0 THEN 2000                     DB
•3030 D=Y-5:IFD<0THEND=0                   AC
•3040 FOR I=Y-1 TO D STEP-1                EJ
•3050 IF I<Y-1 THEN PE=PT:CE=CT            GN
•3060 PT=BLOCK+1024*SCR(Y1,X1)+X+I*40      MC
•3070 CT=55296+X+I*40                      HC
•3080 GOTO 3500                            FF
•3090 :                                    DI
•3100 IF Y=23 THEN 2000                    HA
•3110 D=Y+5:IFD>23THEND=23                 CM
•3120 FOR I=Y+1 TO D                       LB
•3130 IF I>Y+1 THEN PE=PT:CE=CT            IG
•3140 PT=BLOCK+1024*SCR(Y1,X1)+X+I*40      MC
•3150 CT=55296+X+I*40                      HC
•3160 GOTO 3500                            FF
•3170 :                                    DI
•3180 IF X=0 THEN 2000                     CE
•3190 D=X-5:IFD<0THEND=0                   OH
•3200 FOR I=X-1 TO D STEP-1                EI
•3210 IF I<X-1 THEN PE=PT:CE=CT            HM
•3220 PT=BLOCK+1024*SCR(Y1,X1)+I+Y*40      MB
•3230 CT=55296+I+Y*40                      HB
•3240 GOTO 3500                            FF
•3250 :                                    DI
•3260 IF X=39 THEN 2000                    HI
•3270 D=X+5:IFD>39THEND=39                 JF
•3280 FOR I=X+1 TO D                       JO
•3290 IF I>X+1 THEN PE=PT:CE=CT            EF
•3300 PT=BLOCK+1024*SCR(Y1,X1)+I+Y*40      MB
•3310 CT=55296+I+Y*40                      HB
•3320 GOTO 3500                            FF
•3330 :                                    DI
•3500 IF PEEK(PT)>64 AND PEEK(PT)<70 THEN
 I=D:GOTO 3560                             EJ
•3510 IF PEEK(PT)>76 AND PEEK(PT)<80 AND
 MT<>0 THENI=D:MT=0:SC=SC+50:GOTO 3530     PI
•3520 IF PEEK(PT)=76 THEN I=D:GOTO 3560    OP
•3530 POKE PT,79+M:POKE CT,15              MN
•3540 FORT=0TO50:NEXT                      IM
•3550 POKE PE,32:POKE CE,9                 JG
•3560 NEXT:IF PEEK(PE)>79 THEN POKE PE,32
 :POKE CE,9                                GL
•3570 IF PEEK(PT)>79 THEN POKE PT,32:POKE
 CT,9                                      BH
•3580 POKES+4,128:POKES+24,0:GOTO 2000     MO
•3600 POKES+24,15                          IJ
•3610 POKES+5,15:POKES+6,255               BM
•3620 POKES+1,30:POKES,0                   PP
•3630 POKES+4,129                          IN
```

```
·3640 RETURN                                 IM
·3999 :                                      DI
·4000 REM MAN SOUND SUB-ROUTINE              BE
·4001 :                                      DI
·4010 POKES+5,0:POKES+6,15                   MD
·4020 POKES+24,15                            IJ
·4030 POKES+1,30:POKES,0                     PP
·4040 POKES+4,129                            IN
·4050 POKES+4,128                            IK
·4060 POKES+24,0                             FL
·4070 RETURN                                 IM
·4499 :                                      DI
·4500 REM KEY SOUND SUB-ROUTINE              JH
·4501 :                                      DI
·4510 K=K+1:SC=SC+100:NM(Y1,X1)=0            IK
·4520 POKES+5,15:POKES+6,255                 BM
·4530 POKES+24,15                            IJ
·4540 POKES+1,244:POKES,103                  JO
·4550 POKES+4,17                             FF
·4560 FORT=1TO7:POKES+24,15-T*2              BD
·4570 FORI=1TO250:NEXTI,T                    GL
·4580 POKES+4,16                             FG
·4590 POKES+24,0                             FL
·4600 RETURN                                 IM
·4999 :                                      DI
·5000 REM DEAD SOUND SUB-ROUTINE             CL
·5001 :                                      DI
·5005 S=54272                                BI
·5010 POKES+5,244:POKES+6,103                KP
·5020 POKES+24,15                            IJ
·5030 POKES+1,244:POKES,0                    BN
·5040 POKES+4,129                            IN
·5050 FORI=1TO7000:NEXT                      OD
·5060 POKES+4,128                            IK
·5100 POKES+24,0                             FL
·5110 RETURN                                 IM
·5999 :                                      DI
·6000 REM CHANGE SCREEN SUBROUTINE           EO
·6001 :                                      DI
·6005 POKE PX,32:POKE CX,9:POKE PM,32:POK
 E CM,9:MT=1                                 LM
·6010 POKE53272,(PEEK(53272)AND15)ORSCR(Y
 1,X1)*16                                    LN
·6020 V=BLOCK+1024*SCR(Y1,X1)                PH
·6030 POKE 648,INT(V/256)                    BD
·6032 PRINT"[HOME][24"[DOWN]"][38" "][HOM
 E]";                                        BL
·6033 IFX1=0ANDY1=0ANDK=13 THEN 8000         MF
·6034 IFK=13 THEN 6070                       FE
·6035 IF NM(Y1,X1)=0 THEN MT=0:RETURN        LF
·6040 PX=BLOCK+1024*SCR(Y1,X1)+IT(Y1,X1,0
 )+IT(Y1,X1,1)*40                            BK
·6050 CX=55296+IT(Y1,X1,0)+IT(Y1,X1,1)*40    LK
·6060 POKE PX,76:POKECX,1                    KI
·6070 A=IT(Y1,X1,0)+1:B=IT(Y1,X1,1)+1        KJ
·6080 PM=BLOCK+1024*SCR(Y1,X1)+A+B*40        FB
·6090 CM=55296+A+B*40                        DN
·6100 POKE PM,77:POKECM,13                   MF
·6110 RETURN                                 IM
·6999 :                                      DI
·7000 REM GAME OVER                          OH
·7001 :                                      DI
·7005 POKEPO,32:POKEPX,32:POKEPM,32          MD
·7010 POKE56578,PEEK(56578)OR3               BN
·7020 POKE56576,(PEEK(56576)AND252)OR3       KF
·7030 POKE53272,(PEEK(53272)AND240)OR4       IB
·7040 POKE53272,(PEEK(53272)AND15)OR16       NO
·7050 POKE 648,4                             JJ
·7060 PRINT"[CLEAR][WHITE][7"[DOWN]"]";      EJ
·7070 PRINTTAB(14)"GAME OVER[DOWN]"          JL
·7080 PRINTTAB(5)"(PRESS A KEY FOR A NEW
 GAME)"                                      AO
·7090 GETA$:IFA$=""THEN7090                  KM
·7100 PRINTTAB(5)"[UP][28" "]"               FA
·7110 CLR:RESTORE:GOTO 100                   MJ
·7999 :                                      DI
·8000 REM YOU WON!                           KK
·8001 :                                      DI
·8010 POKE56578,PEEK(56578)OR3               BN
·8020 POKE56576,(PEEK(56576)AND252)OR3       KF
·8030 POKE53272,(PEEK(53272)AND240)OR4       IB
·8040 POKE53272,(PEEK(53272)AND15)OR16       NO
·8050 POKE 648,4                             JJ
·8060 PRINT"[CLEAR][WHITE]";                 LH
·8070 PRINT"[5"[DOWN]"][6"[RIGHT]"]YOU AR
 E OPENING THE DOOR[3"."]"                   BF
·8080 GOSUB 4500                             GG
·8090 PRINT"[CLEAR][3"[DOWN]"]";             NM
·8130 PRINTTAB(16)"[RVSON][c 8][sEP][4" "
 ][c *]"                                     MH
·8140 PRINTTAB(16)"[RVSON][c 5][6" "]"       GK
·8150 PRINTTAB(16)"[RVSON][c 5][6" "]"       GK
·8160 PRINTTAB(15)"[RVSON][c 8][sEP][6" "
 ][c *]"                                     ED
·8170 PRINTTAB(15)"[RVSON][c 5][8" "]"       MA
·8180 PRINTTAB(15)"[RVSON][c 5][8" "]"       MA
·8190 PRINTTAB(14)"[RVSON][c 8][sEP][8" "
 ][c *]"                                     FB
·8200 PRINTTAB(14)"[RVSON][c 5][10" "]"      OE
·8210 PRINTTAB(14)"[RVSON][c 5][10" "]"      OE
·8220 PRINTTAB(13)"[RVSON][c 8][sEP][10"
 "][c *]"                                    GJ
·8230 PRINTTAB(13)"[RVSON][c 5][12" "]"      CG
·8240 PRINTTAB(13)"[RVSON][c 5][12" "]"      CG
·8250 PRINTTAB(12)"[RVSON][c 8][sEP][12"
 "][c *]"                                    LL
·8260 PRINTTAB(12)"[RVSON][c 5][14" "]"      IO
·8270 PRINTTAB(12)"[RVSON][c 5][14" "]"      IO
·8280 PRINTTAB(11)"[RVSON][c 8][sEP][14"
 "][c *]"                                    OH
·8290 PRINTTAB(11)"[RVSON][c 5][16" "]"      LE
·8300 PRINTTAB(11)"[RVSON][c 5][16" "]"      LE
·8310 PRINTTAB(10)"[RVSON][c 8][sEP][16"
 "][c *]"                                    EN
·8320 PRINTTAB(10)"[RVSON][c 5][18" "]"      OA
·8330 PRINTTAB(10)"[RVSON][c 5][18" "]"      OA
```

```
·8335 PRINTTAB(9)"[RVSON][c 8][sEP] YOU'R
 E ESCAPING  [c *]";                        LI
·8340 X$="[4" "][DOWN][4"[LEFT]"]"          IK
·8350 A$=X$+X$+X$                           OC
·8360 X$="[6" "][DOWN][6"[LEFT]"]"          BM
·8370 B$=X$+X$+X$+X$+X$                     AO
·8380 X$="[8" "][DOWN][8"[LEFT]"]"          HG
·8390 C$=X$+X$+X$+X$+X$+X$                  EO
·8400 X$="[10" "][DOWN][10"[LEFT]"]"        CA
·8410 D$=X$+X$+X$+X$+X$+X$+X$               JJ
·8420 X$="[12" "][DOWN][12"[LEFT]"]"        EK
·8423 Y$="[4" "]THE[5" "][DOWN][12"[LEFT]
 "]"                                        MN
·8425 Z$="[4" "]END[5" "][DOWN][12"[LEFT]
 "]"                                        MG
·8430 E$=X$+X$+X$+Y$+Z$+X$+X$+X$            MA
·8480 A=17:B=16:C=15:D=14:E=13:F=12:G=11:
 POKE646,14                                 PB
·8490 X=A:Y=0:GOSUB 9000:PRINT"[RVSON]"A$
 :GOSUB9000:GOSUB9020:GOSUB4000:PRINT"[RV
 SOFF]"A$                                   MM
·8500 X=B:Y=1:GOSUB 9000:PRINT"[RVSON]"B$
 :GOSUB9000:GOSUB9020:GOSUB4000:PRINT"[RV
 SOFF]"B$                                   DK
·8510 X=C:Y=3:GOSUB 9000:PRINT"[RVSON]"C$
 :GOSUB9000:GOSUB9020:GOSUB4000:PRINT"[RV
 SOFF]"C$                                   JJ
·8520 X=D:Y=5:GOSUB 9000:PRINT"[RVSON]"D$
 :GOSUB9000:GOSUB9020:GOSUB5000             OI
·8525 GOSUB9000:GOSUB9020:GOSUB4000:PRINT
 "[RVSOFF]"D$                               KL
·8530 X=E:Y=7:GOSUB 9000:PRINT"[RVSON]"E$   NL
·8560 X=0:Y=24:GOSUB9000                    GJ
·8570 PRINTTAB(9)"[RVSON][c 8][sEP][5" "]
 MAYBE[3"."][5" "][c *]";                   NJ
·8580 GOTO8580                              GO
·9000 POKE782,X:POKE781,Y:SYS 65520         ID
·9010 RETURN                                IM
·9020 FORI=1TO1000:NEXT:RETURN              LE
```

Continued from page 84

cue, a futuristic battle with alien forces, a medieval castle siege, and a World War III battle with Germany.

SSI has also announced a line of $14.95 SSI Classics–a marketing euphemism for slashing the price of *Combat Leader, Computer Baseball, Eagles, Fortress,* and *Gemstone Warrior* for the C-64.

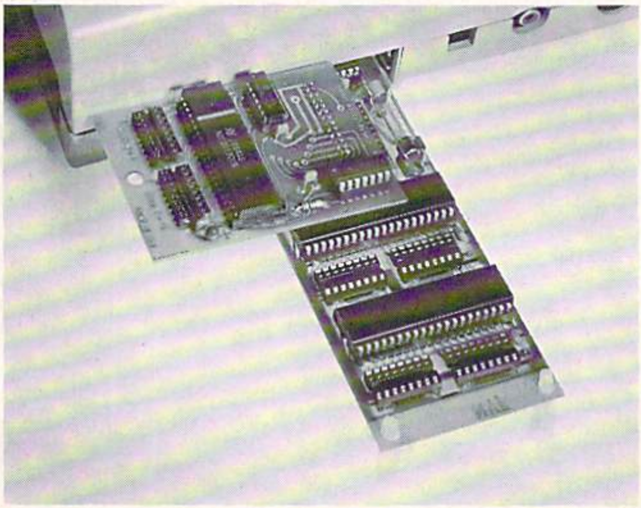
Strategic Simulations, Inc., 415-964-1353 (see address list, page 14).

Two combat simulations on a new Super Silver Disk from Firebird:

Iwo Jima–1945 ($19.95) recreates the WWII battle where 7000 Marines died and 17,000 more were wounded. Five difficulty levels extend the conflict over 32-36 day spans.

Falklands 82 recalls the 1982 battle between Britian and Argentina (there was a dream matchup) over the Falkland Islands. The player commands the UK land forces, and the computer controls the Junta armies.

Firebird, 201-444-5700 (see address list, page 14).



***The new Model 64IF/ADC0816 piggy-backs onto the Dual VIA board as shown, without taking anything away from the VIA ports, adding 16 analog input channels.* READER SERVICE NO. 225**

INTERFACE BOARDS

Schnedler Systems' new 8-bit fast analog-to-digital conversion module (Model 64IF/ADC0816) for the C-64 or 128 piggy-backs onto the previously released Model 64IF22 Dual 6522 Versatile Interface Adapter Board, adding 16 analog input channels. The device used is an ADC0817, which has a 0-5 volt input range for each channel and a 100 microsecond conversion time. For highest speed, the end of conversion output is available, and is utilized by the included ML driver programs. Price is $69; the Dual 6522 VIA is $169 for a single board, $149 for additional boards.

Schnedler Systems, 703-237-4796 (see address list, page 14).

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241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
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